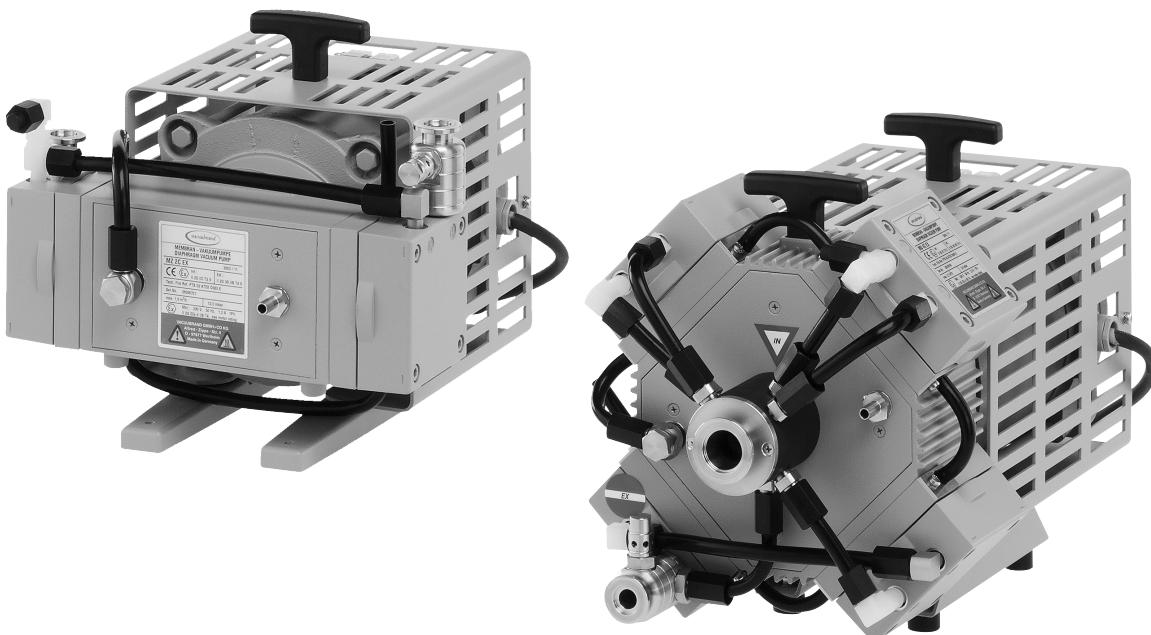


*vacuubrand*

Technology for Vacuum Systems

## Instructions for use



**MZ 2C EX  
MD 4C EX  
MV 10C EX**



**MZ 2C EX + AK + EK  
MZ 2C EX + IK + EK  
MD 4C EX + AK + EK  
MV 10C EX + AK + EK**

**Chemistry diaphragm pumps  
with  
ATEX conformity**

Dear customer,

Your VACUUBRAND diaphragm pump shall support you at your work for a long time without any trouble and with full load output. Thanks to our large practical experience we attained much information how you could add to an efficient application and to personal safety. Please read these instructions for use prior to the initial start-up of your pump.

VACUUBRAND diaphragm pumps are the result of many years of experience in construction and practical operation of these pumps combined with the latest results in material and manufacturing technology.

Our quality maxim is the "zero fault principle":

Every delivered diaphragm pump is tested extensively including an endurance run of 14 hours. Due to this endurance run, also faults, which occur rarely, are reported and can be corrected. Every single diaphragm pump is tested on achievement of the specification after the endurance run.

**Every VACUUBRAND pump leaving our factory achieves the specification. We feel obliged to this high quality standard.**

We are aware that the vacuum pump should not draw a part of the real work and we hope to contribute with our products to an effective and trouble-free realisation of your work.

Yours  
VACUUBRAND GMBH + CO KG

**After sales service: Contact your local dealer or call +49 9342 808-5500.**



**Attention: This manual is not available in all languages of the EU. The user must not operate the device if he does not understand this manual. In this case a technically correct translation of the complete manual has to be available. The manual must be completely read and understood before operation of the device and all required measures must be applied.**

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D, A, CH, B, L

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GB, IRL

Attention: This manual is not available in all languages of the EU. The user must not operate the device if he does not understand this manual. In this case a technically correct translation of the complete manual has to be available. The manual must be completely read and understood before operation of the device and all required measures must be applied.



F, B, L

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DK

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FIN

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GR

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S, FIN

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E

Atención: Este manual no está disponible en todos los idiomas de UE. El usuario no debe manejar el instrumento si no entiende este manual. En este caso se debe disponer de una traducción técnicamente correcta del manual completo. El manual debe ser leído y entendido completamente y deben aplicarse todas las medidas de seguridad antes de manejar el instrumento.



I

Attenzione: Questo manuale non è disponibile in tutte le lingue della Comunità Europea (CE). L'utilizzatore non deve operare con lo strumento se non comprende questo manuale. In questo caso deve essere resa disponibile una traduzione tecnicamente corretta del manuale completo. Il manuale deve essere completamente letto e compreso prima di operare con lo strumento e devono essere applicati tutti gli accorgimenti richiesti.



N

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PL

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SK

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SLO

Pozor: Ta navodila niso na voljo v vseh jezikih EU. Uporabnik ne sme upravljati z napravo, če ne razume teh navodil. V primeru nerazumljivosti mora biti na voljo tehnično pravilen prevod. Navodila se morajo prebrati in razumeti pred uporabo naprave, opravljene pa morajo biti tudi vse potrebne meritve.



CZ

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H

Figyelem! Ez a kezelési utasítás nem áll rendelkezésre az EU összes nyelvén. Ha a felhasználó nem érti jelen használati utasítás szövegét, nem üzemeltetheti a készüléket. Ez esetben a teljes gépkönyv fordításáról gondoskodni kell. Üzembe helyezés előtt a kezelőnek végig kell olvasnia, meg kell értenie azt, továbbá az üzemeltetéshez szükséges összes mérést el kell végeznie.



BG

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RO

Atentie: Acest manual nu este disponibil în toate limbile EU. Utilizatorul nu trebuie să lucreze cu aparatul dacă dacă nu intelege manualul. Astfel, va fi disponibile o traducere corectă și completă a manualului. Manualul trebuie citit și înțeles în întregime înainte de a lucra cu aparatul și a luate toate măsurile care se impun.

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- DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



- ☞ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



- CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE is used to address practices not related to personal injury.



Caution! Hot surface!



Isolate equipment from mains before removing the cover.

# Safety information!

## General information

### NOTICE

- ☞ **Read and comply with this manual before installing or operating the equipment.**

- ☞ Transport the pump at the provided handle.

Remove all packing material, remove the product from its packing-box, remove the protective covers from the inlet and outlet ports and keep, inspect the equipment. If the equipment is damaged, notify the supplier and the carrier in writing within three days; state the item number of the product together with the order number and the supplier's invoice number. Retain all packing material for inspection.

**Do not use the equipment if it is damaged.**

If the equipment is not used immediately, replace the protective covers. Store the equipment in suitable conditions.

## Intended use

### WARNING

- ☞ Use the equipment for the intended use only according to the ATEX conformity, e.g. for pumping gas atmosphere without aerosol in a range from 0.1 to 1000 mbar and a maximum inlet pressure (dynamic pressure) and outlet pressure of 1100 mbar (absolute).
- ☞ The pump and all system parts must not be used on humans or animals.
- ☞ Prevent any part of the human body from coming into contact with vacuum.
- ☞ Ensure that the individual components are only connected, combined and operated according to their design and as indicated in the instructions for use.
- ☞ Comply with notes on correct vacuum and electrical connections, see section "Use and operation".

The pumps are marked with "X" (according to EN 13463-1), i.e. restrictions of the operation conditions:

- The pumps are designated for a low degree of mechanical stress and have to be installed in a way so that they can not be damaged from outside.  
Pumping units have to be installed protected against shocks from the outside and against glass splinters in the event of breaking (implosion).
- The pumps are designated for an ambient and gas inlet temperature during operation of +10 to +40°C. Never exceed these ambient and gas inlet temperatures.

### NOTICE

Use the equipment **for the intended use only**, i.e. for generation of vacuum in vessels designed for that purpose.

## Setting up and installing the equipment

### NOTICE

Before system start-up of the pump or the complete system the user has to evaluate in its entirety the explosion risks and takes adequate measures in application of the principle of risk assessment.

The evaluation and the measures have to be laid down in an explosion protection document before system start-up.

The pump/system must not be operated until danger in explosive atmosphere is ensured. Provide suitable control, protection and warning systems even in the event of failure.

**The inner (pumped media) and outer part of the pump have to be evaluated separately because of their different conformity (see also section "Technical data" and "Notes regarding devices with ATEX conformity").**

The pumps are not suitable for pumping dust and have no approval for operation below ground.

The pumps are not suitable for pumping self inflammable substances, for substances which are inflammable without air and explosive substances.

- ☞ **Electrical and vacuum components might require a separate approval.**
- ☞ Include the components in the recurrent tests of tightness for pressure vessels, in the case of hits and beats an intermediate leak test is required.
- ☞ Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the max. permitted pressure compatible with the mechanical stability of the system.
- ☞ Always provide a free and pressureless exhaust pipeline.
- ☞ Do not permit any **uncontrolled pressurizing** (e.g. make sure that the exhaust pipeline cannot become blocked). If there is an exhaust isolation valve, make sure that you cannot operate the equipment with the valve closed. **Risk of bursting!**

- Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.
- Comply with **maximum permissible pressures** at inlet and outlet and pressure differences, see section "Technical data". Do not operate the pump with overpressure at the inlet.
- **Attention:** Flexible elements tend to shrink when evacuated.

## NOTICE

Provide a firm level platform for the equipment and check that the system to be evacuated is mechanically stable and that all fittings are secure. Ensure a stable position of the pump without any mechanical contact except of the pump feet. Comply with all applicable safety regulations.

**Pumping units (pumps with vapour condenser) have to be installed protected against hits from outside and protected against splinters (against implosion). Adopt suitable measures prior to the first use.**

Obey all relevant requirements (regulations and guidelines) and adopt suitable safety measures.

- ☞ **Pay attention to the max. permitted ambient temperature and make sure ventilation is adequate especially if pump is installed in a housing or if ambient temperature is elevated, install an external automatic ventilation system if necessary.**

If pumping hot process gases make sure that the maximum permitted gas inlet temperature is not exceeded.

- ☞ If the equipment is brought from cold environment into a room for operation, allow the equipment to warm up (pay attention to water condensation on cold surfaces).

- ☞ The work clothing of the user must not lead to electrostatic discharge which may ignite the explosive atmosphere.

**Inlet**

- ☞ Connection lines at the pump inlet have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ The diameter of the inlet pipeline should be at the least as large as the diameter of the pump connection pipelines.
- ☞ Obey max. inlet pressure (see "Technical data").
- ☞ If there is a risk of ignition of gases or gas mixtures before or behind the pump the user has to provide suitable safety devices against incoming of flames according to EN 12874. The user must ensure the suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.

**Outlet**

- ☞ Connection lines at the pump outlet (small flange) have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ The diameter of the inlet pipeline should be at the least as large as the diameter of the pump connection pipelines.
- ☞ Obey max. inlet pressure (see "Technical data").

Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the max. permitted pressure compatible with the mechanical stability of the system.

- ☞ Obey maximum permitted pressures and pressure differences, see section "Technical data". Do not operate the pump with overpressure at the inlet.
- ☞ Do not permit any uncontrolled pressurizing (e. g. make sure that the exhaust pipeline cannot become blocked). If you have an exhaust-isolation valve, make sure that you cannot operate the equipment with the valve closed. Risk of bursting!
- ☞ Ensure that the system design does not allow the exhaust pipeline to become blocked. Lead away exhaust gas or condensate at the outlet of the pump and the overpressure safety valve under consideration of all applicable safety measures. Avoid backflow of gases or condensate definitely.
- ☞ Ensure that the system design does not allow the coolant outlet pipeline to become blocked.
- ☞ Escaped and/or intentional or unintentional released inflammable gases or vapours which may lead to danger of explosion have to be lead away safely or lead to an appropriate place. If not possible enclose the gasses, vapours or mist safely or dispose in an other way. In case of mixtures or different gases the measures must consider the highest risk.
- ☞ If there is a risk of ignition of gases or gas mixtures before or behind the pump the user has to provide suitable safety devices against incoming of flames according to EN 12874. The user must ensure the suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.

Check the overpressure safety valve at the outlet regularly.

- ☞ Attention: If the exhaust pipeline is blocked the pumped gases may escape into the environment through the overpressure safety valve. If necessary take appropriate measures.  
If pumping dangerous gases install a second completely independent exhaust pipeline instead of the overpressure safety valve. If necessary assemble a hose nozzle instead of the overpressure safety valve to lead away the gases through a second exhaust pipeline. Attention: Never combine the exhaust pipelines, i. e. provide a sperate line for each exhaust.

**Inert gas purge**

- ☞ The user must take suitable precautions to prevent any formation of explosive mixtures in the expansion chamber using inert gas to purge the housing. Otherwise in case of a diaphragm crack, mechanically generated sparks, hot surfaces or static electricity may ignite these mixtures.
- ☞ Inert gas connection lines (inlet and outlet) have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ Connect the inert gas connections at the crankcase not serial but parallel.
- ☞ We recommend an inert gas purge of  $\geq 1 \text{ l per minute}$ .
- ☞ Provide an external pressure limitation to a pressure of 1.1 bar absolute if inert gas is connected to the pump or at an air admittance valve. The inert gas has to be dry and pure. It could be recommendable to provide an appropriate control system to supervise the inert gas flow which switches off the pump in case of failure (e. g. absence of inert gas) if necessary.
- ☞ To control the faultless function of the diaphragm it could be recommendable install a gas specific detector at the outlet of the inert gas purge. A signal from the detector indicates a diaphragm crack. Switch off the pump immediately and check diaphragms.

- ☞ It is possible to leave out the inert gas purge if the surrounding of the pump is zone 2 or not an explosive atmosphere.
- ☞ Without inert gas purge the pump outer part has the specification II 3G IIB T4 X.

**Gas ballast**

- ☞ Use only inert gas for gas ballast.
- ☞ We recommend the use of gas ballast when pumping condensable media.
- ☞ Gas ballast connection lines (inlet and outlet) have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ Connect the inert gas connections at the gas ballast and the crankcase not serial but parallel.
- ☞ Provide an external pressure limitation to a pressure of 1.1 bar absolute if inert gas is connected to the pump or at an air admittance valve. The inert gas has to be dry and pure. It could be recommendable to provide an appropriate control system to supervise the inert gas flow which switches off the pump in case of failure (e. g. absence of inert gas) if necessary.

Pumping at high inlet pressure may lead to overpressure at the gas ballast valve.

- ☞ Pumped gases or condensate might be pushed out in case the valve is open.
- ☞ The inert gas lines have to be chemical resistant due to possible backflow.

**Electrical connection**

- ☞ Electrical connection of the pump must be performed only by a suitable trained and supervised personnel.
- ☞ The motor cable for pumps in 230V version contains wires colour coded as follows: green or green and yellow: earth; blue or white: neutral; brown or black: live.
- ☞ Provide a fuse for the mains cable (L and N) according to the current draw of the motor, see "Technical data".
- ☞ The earth connection of the device (potential equalization) has to be performed only using the green or green/yellow earth connection wire. Connect the earth connection wire of the device to the earth connection of the power supply line and the potential equalization point of the environment of the device.
- ☞ When using pumps with two motors absolutely connect both motors as described above. Ensure that always both motors are running.

Attention: Never use the antistatic connection at the housing of the device to connect the device to ground, use only the green or green and yellow connection wire of the motor. Use the antistatic connection at the housing only to perform an antistatic connection of other non-electronic devices and components, e. g. inlet and outlet vacuum hoses or something similar. Never lead away short-circuit currents using this connection. External electric devices have to be connected at the potential equalization point of the environment separately and independent of this device.

## **A WARNING**

- ☞ Equipment must be connected only to a suitable fused and protected electrical supply and a suitable earth point by suitable trained personnel. Failure to connect the motor to ground may result in deadly electrical shock.
- ☞ Check that mains voltage and current conform with the equipment (see rating plate).
- ☞ **Obey notes regarding the motor in section "Instructions manual: Explosion proof motors", see below.**

The motor is protected by a **thermal cutout with manual reset combined with an overcurrent protection**.

## **A WARNING**

- ☞ Avoid reliable high heat supply (e. g. due to hot process gases). Maximum permitted gas and ambient temperature see "Technical data".
- ☞ Make sure ventilation is adequate especially if pump is installed in a housing or if ambient temperature is elevated, install an external automatic ventilation system if necessary.
- ☞ Ensure that in case of **pumps with two motors** both motors are switched on at the same time, if not possible switch on the motor of the pump at the outlet first.

### ***Ambient conditions***

To the best of our knowledge the equipment is in compliance with the requirements of the applicable EC-directives and harmonized standards (see "Declaration of conformity") with regard to design, type and model, especially directive EN 61010-1. This directive gives in detail conditions, under which the equipment can be operated safely (see also IP degree of protection).

Adopt suitable measures in case of differences, e. g. using the equipment outdoors, installation in altitudes of more than 1000 m above mean sea level, conductive pollution or dewiness.

Pay attention to the **permissible maximum ambient and gas inlet temperatures** (see "Technical data").

### ***Operating conditions***

The pumps have a conformity according to their specification to be installed in areas and to pump out of areas which contain under normal operation conditions occasionally a potential explosive atmosphere as a mixture of air with inflammable gases or vapours (**category 2**). **Class of ignition and temperature see "Technical data".** **The specification for category 2 for the outer part of the pump is only valid when purging the crankcase with inert gas. Without inert gas purging the pump has the specification II 3G IIB T4 X for the outer part.**

Ensure that the materials of the wetted parts are compatible with the pumped substances, see section "Technical data".

## **A**WARNING

- ☞ Adopt suitable measures to prevent the release of dangerous, explosive, corrosive or polluting fluids.
- ☞ If pumping **different substances**, it is recommended to purge the pump with air or inert gas prior to changing the pumped media in order to pump out residues and to avoid reactions of the pumped substances with each other and with the pump materials.
- Take into consideration interactions and chemical reactions of the pumped media.** Ensure that the materials of the wetted parts are compatible with the pumped substances, see section "Technical data".
- ☞ The valves and the diaphragms are wear parts. Replace the diaphragms and valves at the latest at 90% of the typical lifetime or immediately at higher noise level. The typical lifetime of a diaphragm is 15000 operation hours when pumping non-corrosive or non-condensable gases, if necessary provide an operation time counter.
- ☞ Check the overpressure safety valve between the pump stages (only pumps with four cylinders) regularly and replace at the latest at 90% of the typical lifetime (typical lifetime: 15000 operation hours).
- ☞ Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers), wear appropriate safety-clothing and safety glasses.
- ☞ Obey applicable regulations when disposing of chemicals. Take into consideration that chemicals may be polluted.
- ☞ Adopt suitable measures to prevent contamination of the pumped substances or the environment.

Electronic equipment is never 100% fail-safe. This may lead to an indefinite status of the equipment. Provide protective measures against malfunction and failure.

- ☞ Operating the pump, stand still of the pump or operating the air admittance valve must not lead to a critical dangerous situation under any circumstances.

Ensure that in case of failure the pump and the vacuum system always will turn into a safe status.

- ☞ In case of leaks in the manifold or diaphragm cracks pumped substances might be released into the environment or into the pump housing. To reduce the risk of leaks, ask for a diaphragm pump with additional safety diaphragm.
- ☞ Obey especially notes on operation and use and maintenance.
- ☞ Failure of the pump (e. g. by power failure) or connected components, parts of the supply (e. g. coolant) or change of parameters (e. g. increase of pressure in the coolant system) must not lead to a critical dangerous situation under any circumstances.

### Safety during operation

#### **DANGER**

- Adopt suitable measures to prevent the release of dangerous, toxic, explosive, corrosive, noxious or polluting fluids, vapours and gases. In case install an appropriate collecting and disposal system and take protective action for pump and environment.
- Prevent any part of the human body from coming into contact with vacuum.
- Potentially explosive mixtures at the outlet of the pump have to be drained appropriately, sucked off or diluted with inert gas to non-explosive mixtures.



#### **WARNING**

- ☞ Pay attention to the symbol "hot surfaces" on the equipment. Adopt suitable measures to prevent any danger arising from the formation of hot surfaces or electric sparks. Provide a suitable protection against contact if necessary.
- ☞ Always provide free and pressureless exhaust pipelines.
- ☞ Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.  
Check liquid level in both catchpots regularly and drain condensate in time.

#### **WARNING**

- ☞ Pumping at **high inlet pressure** may lead to overpressure at the gas ballast valve. Pumped gases or condensate might be pushed out in case the valve is open. If an inert gas supply is connected, ensure that the inlet pipeline is not contaminated.

#### **CAUTION**

- Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be polluted.  
Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers), wear appropriate safety-clothing and safety glasses.

Use only genuine spare parts and accessories.

- ☞ Otherwise safety and performance of the equipment as well as the electromagnetic compatibility of the equipment might be reduced.
- ☞ If not using genuine spare parts the ATEX conformity becomes invalid.

Do not start the pump if the pressure difference between inlet and outlet port exceeds 1.1 bar at maximum.

Prevent the backpressure of gases and the backflow of condensates.

Never suck liquids or dust into the pump.

Ensure that in case of failure the pump and the vacuum system always will turn into a safe status.

Provide appropriate protective measures (i.e. precautions which allow for the requirements of the respective application) even for the case of failure and **malfuction**.

Failure of the pump (e.g. due to power failure) or of connected components, parts of the supply or change of parameters must not lead to a critical dangerous situation under any circumstances. In case of diaphragm cracks or leaks in the manifold pumped substances might be released into the environment or into the pump housing or motor. Comply especially with notes on operation and use and maintenance.

#### **CAUTION**

- Due to the residual **leak rate of the equipment**, there might be an exchange of gas, albeit extremely slight, between the environment and the vacuum system. Adopt suitable measures to prevent contamination of the pumped substances or the environment.

## **Maintenance and repair**

**Wear parts have to be replaced regularly.** In normal use, the lifetime of the diaphragms and valves is typically 15,000 operating hours. Bearings have a typical durability of 40000 h.

- The motor capacitors have to be replaced after 200000 start/stop cycles at the latest. If an overaged motor capacitor fails it might get hot and even melt and may cause a flame to form which could be **dangerous for persons and equipment in the vicinity**. The capacitors have to be replaced only at the factory.

Use only genuine spare parts and accessories.

- ☞ Otherwise safety and performance of the equipment as well as the electromagnetic compatibility of the equipment might be reduced.
- ☞ If not using genuine spare parts the ATEX conformity becomes invalid.

Ensure that maintenance is done only by suitable trained and supervised technicians.

- **Isolate equipment from mains** and **wait two minutes** before starting maintenance to allow the capacitors to discharge.
- Before starting maintenance vent the pump, isolate the pump and other components from the vacuum system. Allow sufficient cooling of the pump. Drain condensate, if applicable.



## **WARNING**

- ☞ **Ensure that the pump cannot be operated accidentally. Never operate the pump if covers or other parts of the pump are disassembled. Never operate a defective or damaged pump.**

- ☞ **Attention:** The pump might be contaminated with process chemicals which have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

- ☞ Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers), wear appropriate safety-clothing and safety glasses.
- ☞ To avoid danger due to electrostatic ignition wipe the device or parts of the device only with a humid cloth.

In order to comply with law (occupational, health and safety regulations, safety at work law and regulations for environmental protection) vacuum pumps, components and measuring instruments returned to the manufacturer can be repaired only when certain procedures (see section "**Notes on return to the factory**") are followed.

# Notes regarding devices with ATEX conformity

**This information sheet does not replace the instructions for use!**

In directive 89/391/EWG the European Union has defined requirements for safety at work, which later have been detailed for explosive atmospheres in the directive 1999/92/EG.

The requirements to equipment for operation in explosive atmospheres have been defined in the directive 94/9/EG (also known as ATEX 100a or ATEX 95). In 1996 this directive was implemented into German law (11. Geräteschutzverordnung).

Concerning technology these directives only state general requirements. Technical details and test procedures are „recommended“ in European standards (e.g. for equipment with ATEX conformity: EN 1127, E50014ff, EN 60079, EN 13463ff.).

Since July 1st 2003 equipment intended for use in potentially explosive atmospheres shall only be sold if the equipment is in accordance with directive 94/9/EG (ATEX). This applies only to new equipment. The repair of equipment sold prior to July 1st, 2003 is not affected. Pumps of prior design (pumps with Ex-approved motor only) must not be brought to the market anymore.

## Requirements to user and manufacturer of equipment according to ATEX:

The user of a system according to ATEX has to analyse the overall explosion risks according to directive 1999/92/EC and has to take adequate measures by means of a risk assessment. The evaluation and validation of measures has to be documented in an explosion protection document, specifying among other things the areas classified as potentially explosive (see below). The inner part of the pump (pumped gases) and the environment of the pump (outer explosion protection) have to be evaluated separately. Often the requirements will be different.

The responsibility for the classification of areas with potentially explosive atmospheres into zones and for the specification of requirements to the equipment (category of equipment, class of ignition, temperature class etc.) is accountable strictly to the operator of the system.  
The equipment used has to comply with these requirements. VACUUBRAND does not advise customers concerning requirements to the equipment under the specific aspects of the customers applications.  
Equipment with ATEX-conformity is to be used by appropriately instructed personnel only.

## ATEX marking, intended use:

The marking of the equipment corresponding with the standards (see above) gives the areas in which the equipment may be used according to its intended use.

**Technical data, safety notes and intended use:  
See instructions for use!**

**The equipment must only be used if the instructions for use are read, fully understood and obeyed.**

**Clean, check and maintain equipment regularly.**

**Do never operate a defective equipment.**

## **Electrical connection:**

VACUUBRAND diaphragm pumps with ATEX-conformity are equipped with a 230 V / 50 Hz single-phase motor and are protected by a thermal cutout with manual reset combined with an overcurrent protection.

See instructions for use concerning notes on electrical connection

Where applicable the motors can be connected directly to an appropriate power supply by suitably trained and authorised personnel (electrician). It is the responsibility of the user to meet the requirements of explosion protection in the power supply and connection area.

## **Vacuum and outlet connections:**

**See instructions for use: Make sure that all mechanical connections  
are always gas tight and electrically conducting.**

**The exhaust pipeline must be designed in a way that it cannot become blocked.**

If the exhaust pipeline becomes blocked, the overpressure safety device at the pump releases potentially dangerous gases into the environment. Take appropriate safety measures (see instructions for use).

**Evaluate the risk of explosion for the release of pumped gases at the outlet of the pump.**

## **Use and connection of inert gas supply:**

For external ATEX equipment category 2G (e.g. for use in Ex-zone 1) the crank case of the pump has to be flushed with inert gas (e.g. nitrogen). A flow of approx. 1 l/min (at atmospheric pressure) is sufficient. If necessary the flow should be monitored using a flow meter. Without inert gas purge the pump has external equipment category 3G. This means the pump has to be used in this case only in a surrounding with Ex - zone 2 (or no Ex-zone).

It is recommended to install a gas detector (specific to the pumped gas) at the outlet of the inert gas tubing. The maximum permitted overpressure at the inert gas outlet is 0.1 bar (Check the flow rate through the gas detector!). A positive signal from the detector indicates a diaphragm failure. In this event switch off the pump immediately and check the pump.

**In the case of pumping condensable vapours, use gas ballast. Connect inert gas with maximum overpressure of 0.1 bar to the gas ballast inlet (see instructions for use).**

**Inlet of air into the gas ballast must never lead to formation of an explosive mixture inside the pump or at the outlet of the pump!**

## Technical data

Type	MZ 2C EX MZ 2C EX + AK + EK MZ 2C EX + IK + EK	MD 4C EX MD 4C EX + AK + EK	MV 10C EX MV 10C EX + AK + EK
ATEX approval Inner part (pumped gases) Outer part Surrounding of the pump with inert gas purge Surrounding of the pump without inert gas purge Motor		II 2G IIC T3 X  II 2G IIB T4 X II 3G IIB T4 X see motor rating plate	
Max. pumping speed* according to ISO 21360	m <sup>3</sup> /h	1.9	3.7
Ultimate vacuum* (absolute) without gas ballast	mbar	12	3
Ultimate vacuum* (absolute) with gas ballast	mbar	18	10
Max. permitted pressure at the inlet and the outlet (absolute)	bar		1.1
Max. permitted pressure difference between inlet and outlet	bar		1.1
Max. permitted pressure at inert gas connection (absolute)	bar		1.1
Max. permitted ambient temperature during operation	°C		+10 to +40
Max. permitted ambient temperature during storage	°C		-10 to +60
Permitted gas inlet temperature	°C		+10 to +40
Max. surface temperature of the pump (outer part)	°C		110
Max. permitted atmospheric moisture during operation (no condensation)	%		30 to 85
Degree of protection of the pump IEC 529 Pump Pump + AK + EK / Pump + IK + EK		IP 54** IP 52**	IP 54** IP 54**
Nominal current draw	A	1.2	2
Maximum start-up current / Start-up duration		5.5 A / 125 ms	10.2 A / 125 ms
Max. permitted range of voltage supply / frequency			230V ± 10% / 50 Hz
Integral leak rate	mbar <sup>1</sup> /s		0.1

\* Technical data according to EN 61010-1 and EN 1012-2 recommendation. The pump achieves its ultimate pumping speed and ultimate vacuum only at operating temperature (after approx. 15 min.).

\*\* Only when positioning the pump horizontal.

We reserve the right for technical modifications without prior notice!

Type	MZ 2C EX MZ 2C EX + AK + EK MZ 2C EX + IK + EK	MD 4C EX MD 4C EX + AK + EK	MV 10C EX MV 10C EX + AK + EK
Motor power	kW	0.15	0.25
No-load speed	min <sup>-1</sup>	1500	
A-weighted emission sound pressure level*** (uncertainty K <sub>pA</sub> : 3 dB(A))	dB(A)	50	53
Inlet Pump Pump + IK + EK		KF 16 hose nozzle DN 13 mm	KF 25 -
Outlet Pump Pump + AK + EK / Pump + IK + EK		KF 16 hose nozzle 10 mm	
Gas ballast connection		hose nozzle 10 mm	
Inert gas purge connection		hose nozzle 8 mm	
Recommended flow of inert gas	l/min	≥ 1	
Overall dimensions L x B x H, approx.	mm	340 x 290 x 250 357 x 308 x 470 357 x 308 x 470	440 x 265 x 305 600 x 365 x 420 -
Pump Pump + AK + EK Pump + IK + EK	mm	560 x 430 x 410 on request	-
Mass, approx. Pump Pump + AK + EK Pump + IK + EK	kg	21.6 25.4 on request	29.3 37.4 -
			63.2 on request

\*\*\* Measurement according to EN ISO 2151:2004 and EN ISO 3744:1995 at 230V/50Hz and ultimate vacuum with exhaust tube at outlet.

We reserve the right for technical modifications without prior notice!

**Wetted parts**

<b>Components</b>	<b>Wetted parts</b>
Inlet	stainless steel*
Outlet	stainless steel**
Pump	PBT
Pump + AK + EK	
Hoses	PTFE, antistatic
Fittings	ETFE / stainless steel*
Housing cover insert	PTFE, carbon reinforced
Head cover	ETFE, carbon reinforced
O-ring in head cover	FPM
Diaphragm clamping disc	ETFE, carbon reinforced
Valve	FFKM or PTFE
Diaphragm	PTFE
Overpressure safety relief device	stainless steel***, PTFE, carbon reinforced, FFKM
Separator cover plate	PTFE, carbon reinforced
Catchpot, collecting flask, vapour condenser	borsilicate glass

\* stainless steel 1.4404

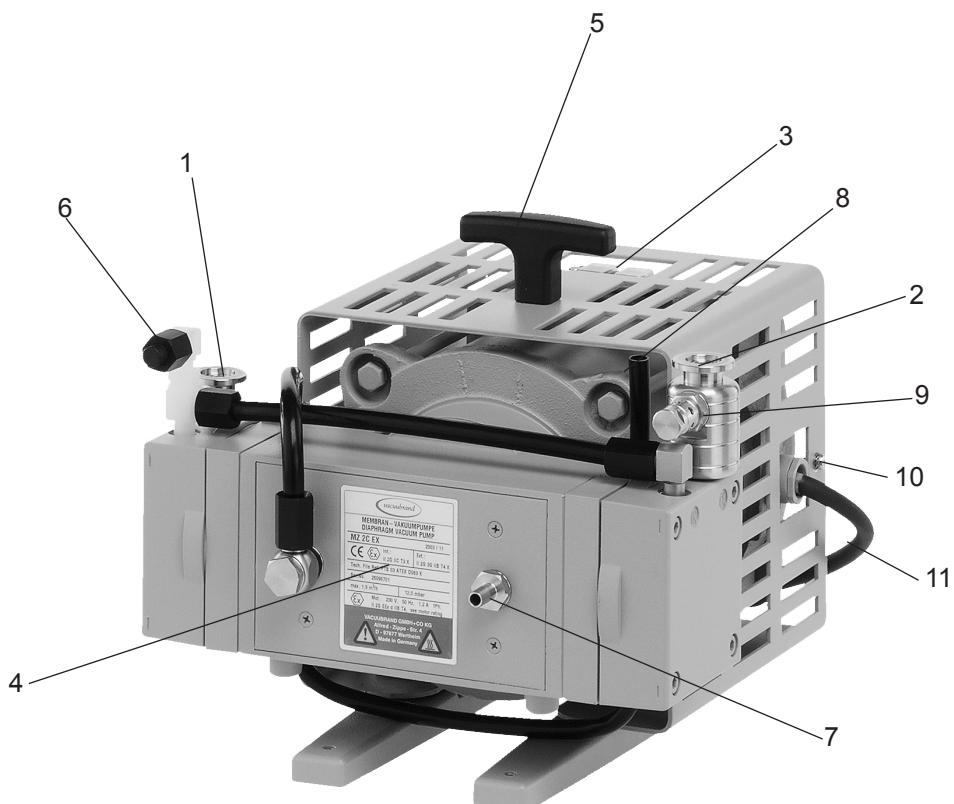
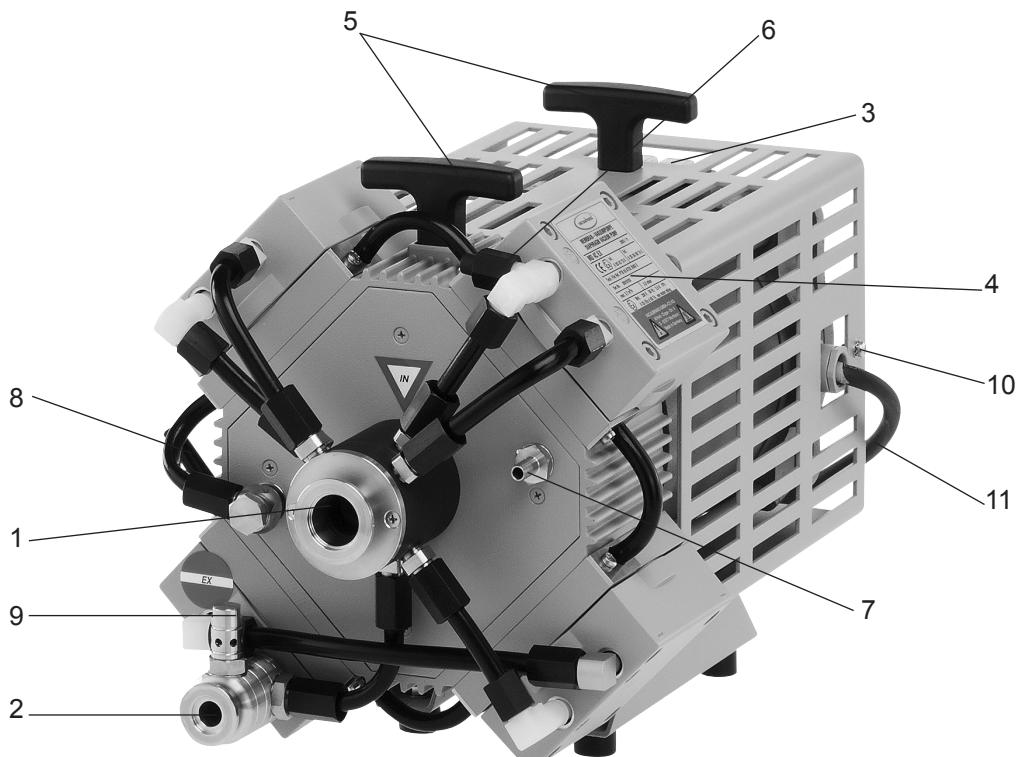
\*\* stainless steel 1.4541

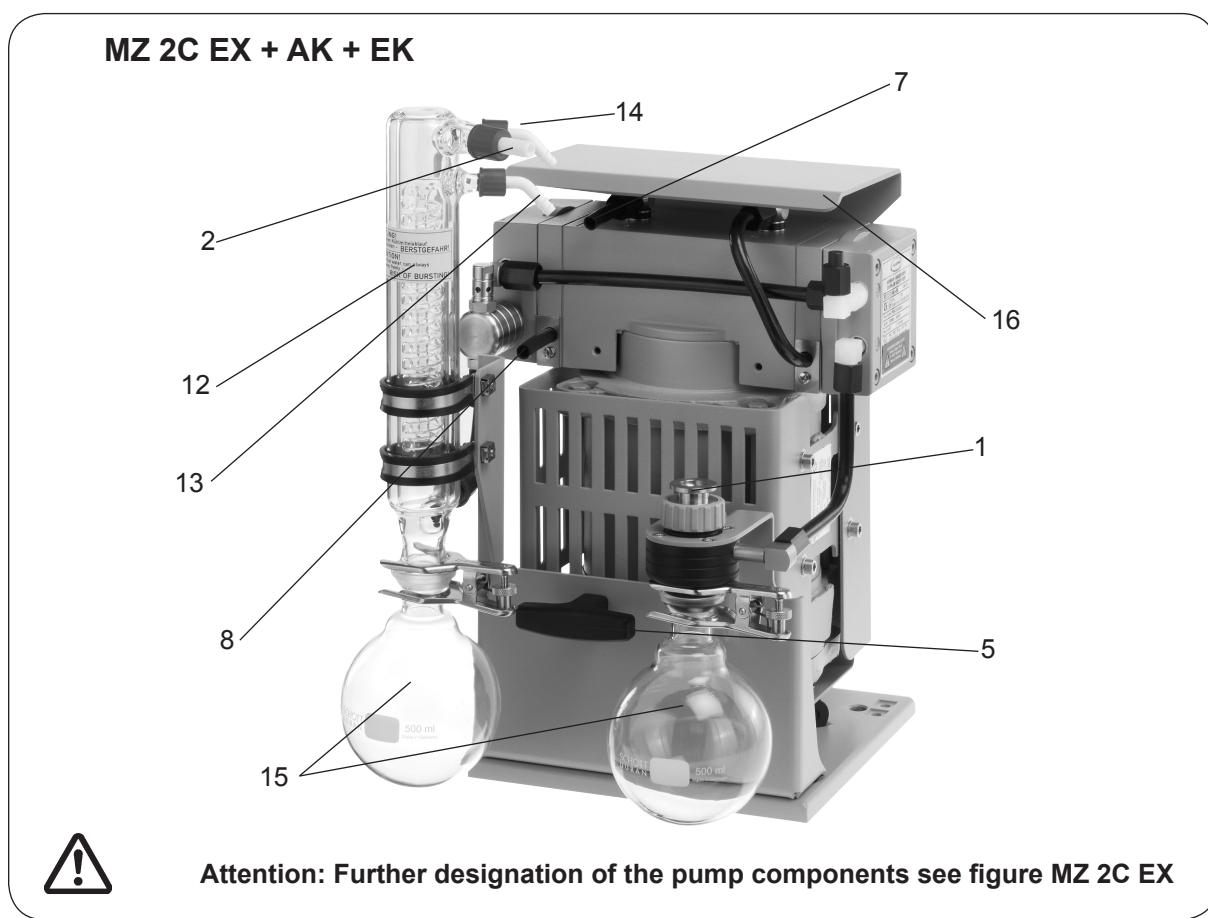
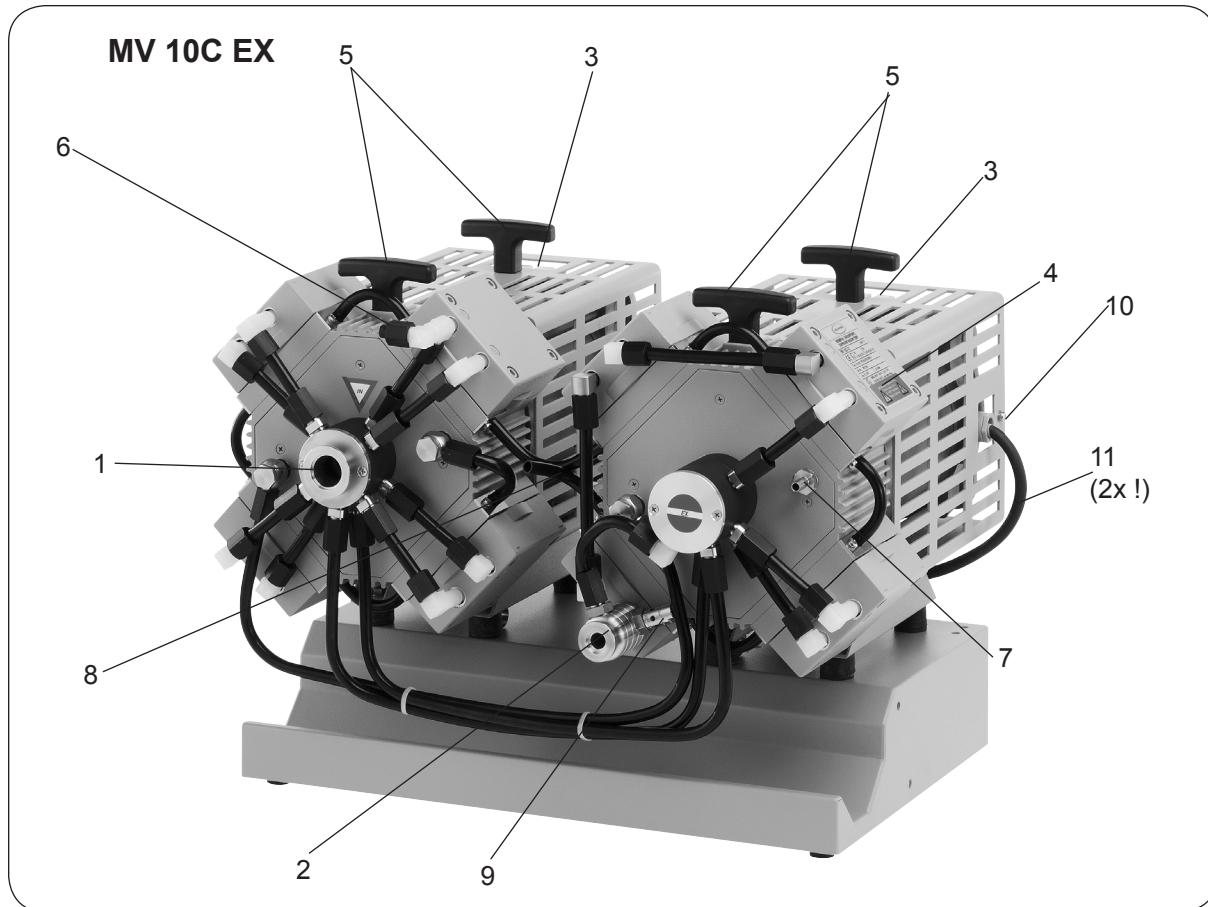
\*\*\* stainless steel 1.4404 and 1.4310

**Pump parts**

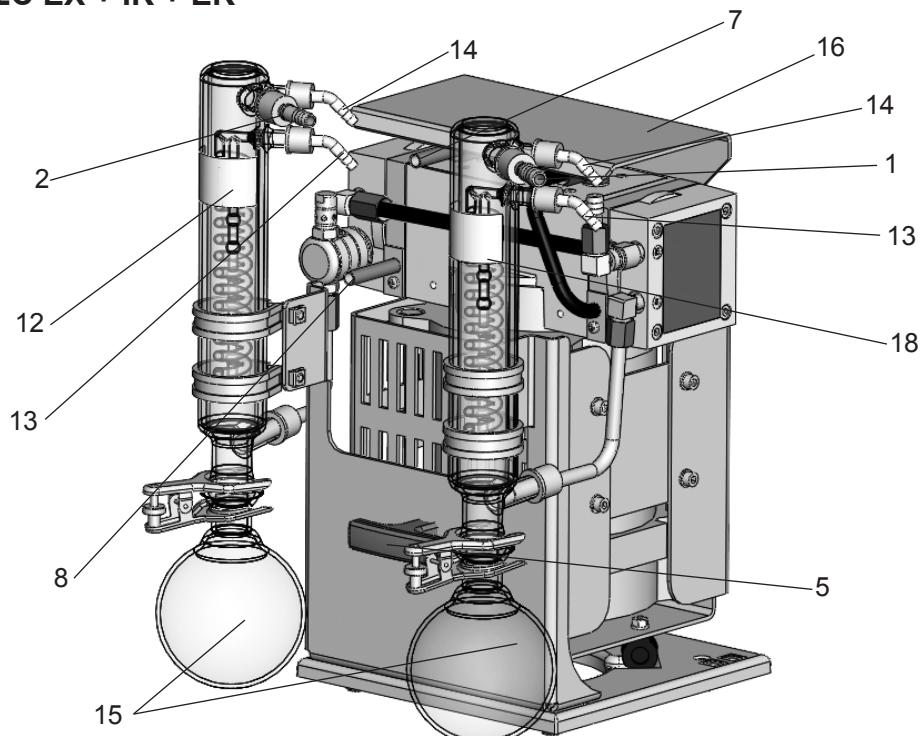
<b>Position</b>	<b>Component</b>	<b>Position</b>	<b>Component</b>
1	inlet (vacuum connection)	12	exhaust waste vapour condenser
2	outlet (gas!)	13	coolant inlet (hose nozzle 6 mm)
3	on/off switch (0: off, 1: on)	14	coolant outlet (hose nozzle 6 mm)
4	rating plate	15	catchpot
5	handle	16	cover plate
6	gas ballast connection (only inert gas)	17	collecting flask
7	inlet inert gas purge	18	immission condenser
8	outlet inert gas purge		
9	overpressure valve		
10	antistatic connection		
11	mains cable		

**We reserve the right for technical modifications without prior notice!**

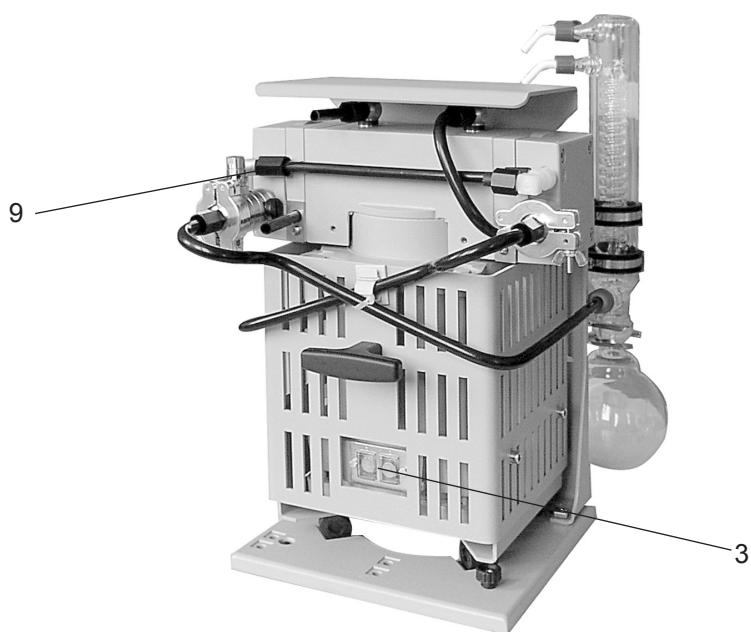
**MZ 2C EX****MD 4C EX**



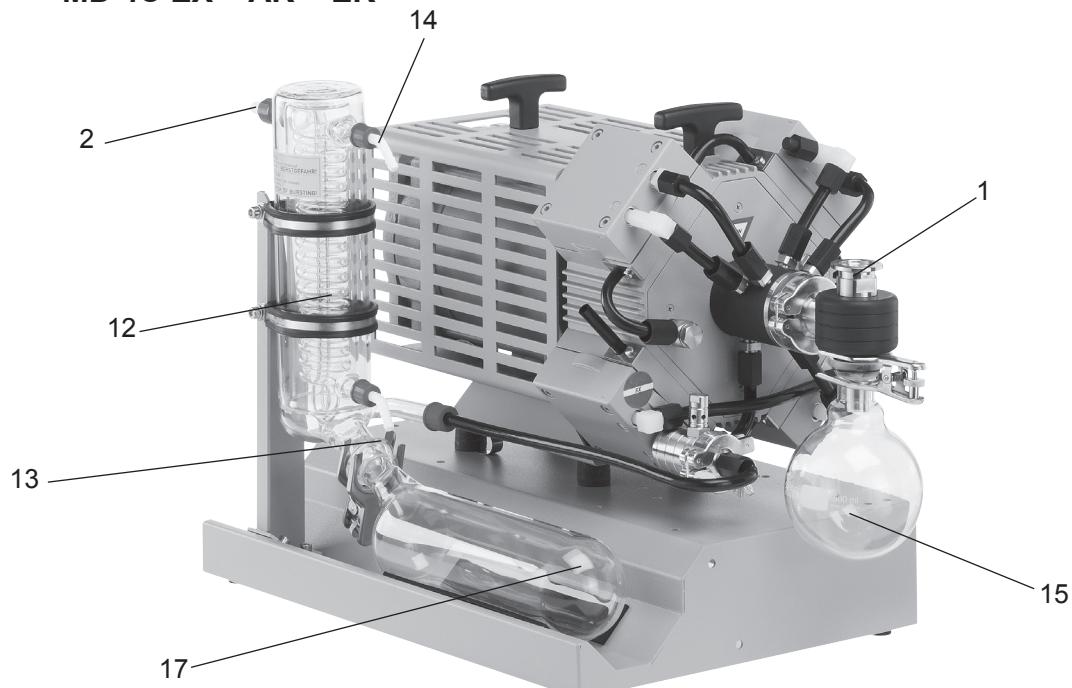
Attention: Further designation of the pump components see figure MZ 2C EX

**MZ 2C EX + IK + EK**

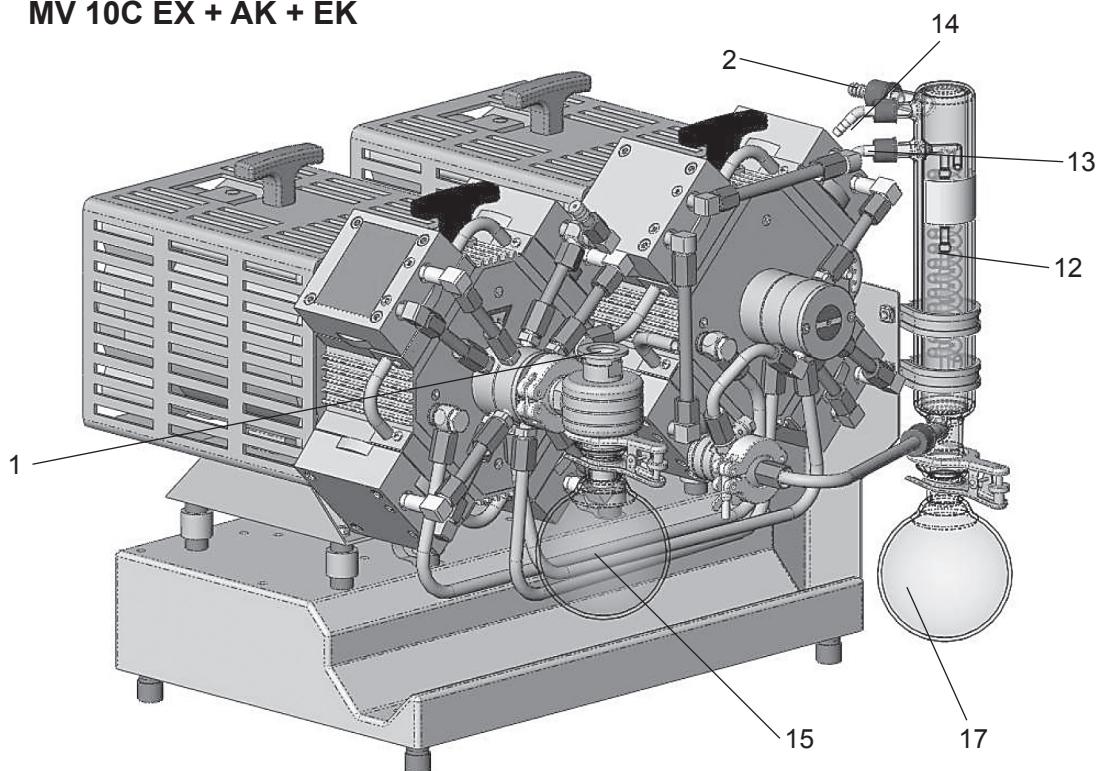
**Attention:** Further designation of the pump components see figure MZ 2C EX

**MZ 2C EX + AK + EK / MZ 2C EX + IK + EK (rear side)**

**Attention:** Further designation of the pump components see figure MZ 2C EX

**MD 4C EX + AK + EK**

Attention: Further designation of the pump components see figure MD 4C EX

**MV 10C EX + AK + EK**

Attention: Further designation of the pump components see figure MV 10C EX

## Use and operation

### ***Installing in a vacuum system***

#### **CAUTION**

- All connection lines at the pump (e. g. inlet, outlet, gas ballast connection, inert gas connection) have to be performed conductive grounded.
- Connect pump and all connected components to ground.
- Avoid contact of the pump with rusty metal parts, e. g. by positioning the pump with sufficient distance to surrounding parts.
- The pump is designated for a low degree of mechanical stress. Protect the pump from damage and beats. In case of damage switch off the pump immediately, check leak rate if necessary.
- Connection lines at the pump inlet have to be gas tight. Particles and dust must not be aspirated, the user has to provide appropriate filters if necessary. The user must ensure their suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.
- Connect an exhaust line gas tight at the pump outlet if necessary. Always dispose of exhaust gases appropriately (e.g. into a fume hood). If there is risk of release of dangerous or polluting fluids, install an appropriate system to catch and dispose of those fluids.
- Reduce the transmission of vibration and prevent mechanical load due to rigid pipelines. Insert elastic hoses or flexible elements as couplings between the pump and rigid pipes. **Attention:** Flexible elements tend to shrink when evacuated.
- Use of a suitable valve to isolate the pump from the vacuum system is recommended to allow the pump to warm up before pumping condensable vapours or to clean the pump before it is switched off.
- The gas outlet must never be blocked. The exhaust line has always to be free (pressureless) to ensure an unimpeded discharge of gas.
- Especially if the gas ballast valve is open, a power failure may cause accidental ventilation of the pump. In case this constitutes a potential source of danger, take appropriate safety measures.
- Make sure ventilation is adequate especially if the pump is installed in a housing or if the ambient temperature is elevated. Provide external ventilation if necessary. Keep a distance of minimum 20 cm between fan and ambient parts.

#### **NOTICE**

Avoid throttling losses by using connecting pipes with large diameter and by keeping them as short as possible.

In case of perturbing exhaust noise connect an exhaust hose. Install outlet pipelines always falling to avoid backflow of condensate towards the pump.

When assembling, ensure **vacuum-tightness**. After assembly, check the whole system for leaks. Secure hose connections at the pump appropriately against accidental detaching.

#### **NOTICE**

Attach the pipelines of the coolant circuit to the respective hose nozzles (hose nozzles 6-8 mm, see image) at the vapour condenser. Check hose connections prior to starting operation of the cooling system.

Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.

**CAUTION**

- The gas outlet must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.
- If necessary connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere.
- **Attention:** Install hoses of the cooling system in a way to avoid flow / dropping of condensed water onto the pumping unit (especially cables and electronic parts).
- Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.
- Install an optional coolant valve always in the supply line of the vapour condenser only.

**Connection of the mains cable**

- ☞ Electrical connection of the pump must be performed only by a suitable trained and supervised personnel.
- ☞ The motor cable for pumps in 230V version contains wires colour coded as follows: green or green and yellow: earth; blue or white: neutral (N); brown or black: live (L).
- ☞ Provide a fuse for the mains cable (L and N) according to the current draw of the motor, see "Technical data".
- ☞ The earth connection of the device (potential equalization) has to be performed only using the green or green/yellow earth connection wire. Connect the earth connection wire of the device to the earth connection of the power supply line and the potential equalization point of the environment of the device.  
Attention: Never use the antistatic connection at the housing of the device to connect the device to ground, use only the green or green and yellow connection wire of the motor. Use the antistatic connection at the housing only to perform an antistatic connection of other non-electronic devices and components, e. g. inlet and outlet vacuum hoses or something similar. Never lead away short-circuit currents using this connection. External electric devices have to be connected at the potential equalization point of the environment separately and independent of this device.
- ☞ In case of power failure unintentional venting of the system is possible. Adopt suitable measures if this might lead to a dangerous situation.

**Inlet**

- ☞ Connection lines at the pump inlet have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ Particles and dust must not be aspirated, the user has to provide appropriate filters if necessary. The user must ensure the suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.
- ☞ If there is a danger of deposits in the pump chamber (check inlet and outlet of the pump) control the pump chamber regularly and clean if necessary.
- ☞ If there is a risk of ignition of gases or gas mixtures before or behind the pump the user has to provide suitable safety devices against incoming of flames according to EN 12874. The user must ensure the suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.

**Connection of the inert gas purge**

- ☞ Connect the inert gas connections at the gas ballast and the crankcase not serial but parallel.
- ☞ Inert gas connection lines (inlet and outlet) have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ We recommend an inert gas purge of  $\geq 1 \text{ l per minute}$ .

**WARNING**

## **A WARNING**

- ☞ To control the faultless function of the diaphragm it could be recommendable to install a gas specific detector at the outlet of the inert gas purge. A signal from the detector indicates a diaphragm crack. Switch off the pump immediately and check diaphragms.
- ☞ If the surrounding of the pump is not an explosive atmosphere it is possible to leave out the inert gas purge.

### **Connection of the inert gas gas ballast**

- ☞ Connect the inert gas connections at the gas ballast and the crankcase not serial but parallel.
- ☞ Use only inert gas at the gas ballast connection. Therefore replace the blind cap at the gas ballast connection by the hose nozzle enclosed.
- ☞ Gas ballast connection lines (inlet and outlet) have to be performed conductive grounded and gas tight (designation of the pump connections see figures).
- ☞ Provide an external pressure limitation to a pressure of 1.1 bar absolute if inert gas is connected to the pump or at an air admittance valve. The inert gas has to be dry and pure. Provide an appropriate control system to supervise the inert gas flow which switches off the pump in case of failure (e. g. absence of inert gas) if necessary.

Attention: Important notes regarding the use of gas ballast

- ☞ When using air rather than inert gas, risk of significant damage to equipment and/or facilities, risk of personal injury or even loss of life exists due to the formation of hazardous and/or explosive mixtures if air and pumped media react inside or at the outlet of the pump.

### **Outlet of the pump**

- ☞ Always connect an exhaust lines at the pump outlet (small flange or hose nozzle 10 mm). Perform the outlet line conductive grounded and gas tight (designation of the pump connections see figures). Always connect the exhaust to a suitable treatment plant (e. g. hood).
- ☞ Potential explosive mixtures at the outlet of the pump have to be drained appropriately, sucked off or diluted with inert gas not explosive mixtures.
- ☞ If there is a danger of deposits in the pump chamber (check inlet and outlet of the pump) control the pump chamber regularly and clean if necessary.
- ☞ If there is a risk of ignition of gases or gas mixtures before or behind the pump the user has to provide suitable safety devices against incoming of flames according to EN 12874. The user must ensure the suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.

### **Overpressure safety valve at the outlet of the pump**

- ☞ The overpressure safety valve at the outlet prevents reliable high pressures in the system. Check overpressure safety valve regularly and replace if necessary.
- ☞ Attention: If the exhaust pipeline is blocked the pumped gases may escape into the environment through the overpressure safety valve. If necessary take appropriate measures.

If pumping dangerous gases install a second completely independent exhaust pipeline instead of the overpressure safety valve. If necessary assemble a hose nozzle (thread G 1/4) instead of the overpressure safety valve to lead away the gases or condensate through a second exhaust pipeline. Attention: Never combine the exhaust pipelines, i. e. provide a separate line for each exhaust.

## **A WARNING**

## **A DANGER**

**Attention:** Deposits and condensate may lead to increased temperature and to excess of the max. permitted temperatures! Increased temperatures possibly may lead to ignition of flammable mixtures inside the pump.  
 Use inert gas gas ballast if necessary and check pump regularly for deposits.  
 Install a gas washing bottle, condenser, filter, separator, etc. at the inlet of the pump if necessary.

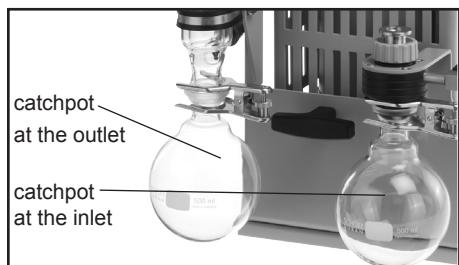
**Pumps with two motors****WARNING**

- ☞ Ensure that in case of pumps with two motors both motors are switched on at the same time, if not possible switch on the motor of the pump at the outlet first.
- ☞ Connect the inert gas connections at the crankcase not serial but parallel.

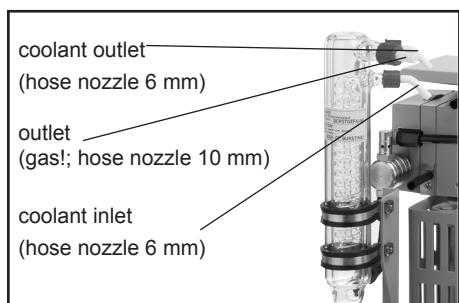


**Attention:** Glass parts (flasks and condensers) of pumping units (pumps with AK (IK) and EK) have no protection against splinters (against implosion) or against leakage in case of mechanical damage or hits from outside.

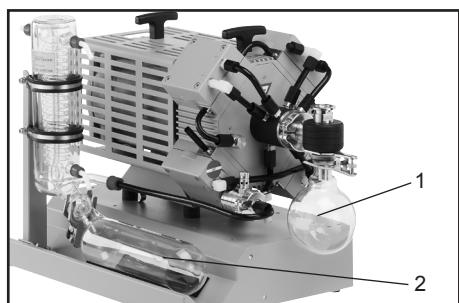
The user must ensure an appropriate protection against splinters / implosion or leakage prior to the first use.

**MZ 2C EX + AK + EK / MZ 2C EX + IK + EK**

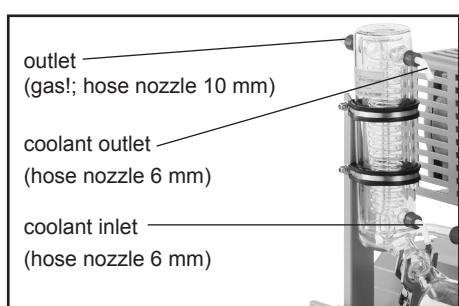
- Assemble catchpot at the inlet and at the outlet using joint clips (fig.: MZ 2C EX + AK + EK)



- Assemble hose nozzles for cooling water inlet and outlet at the vapour condenser.

**MD 4C EX + AK + EK / MV 10C EX + AK + EK**

- Assemble catchpot at the inlet (1) using joint clips.
- ☞ The collecting flask at the outlet (2) is already assembled.



- Assemble hose nozzles for cooling water inlet and outlet at the vapour condenser.

**Separation of condensate:**

**Attention: Due to electrostatics reasons the vapour condenser has no protective layer to avoid separation of condensed water! Risk of bursting!**

## **CAUTION**

- Maximum permissible coolant pressure at the vapour condenser: 6 bar (absolute). Backflow always pressureless.
- Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g. coolant valve).
- Avoid overpressure in the coolant circuit (e.g. caused by blocked or squeezed coolant hoses).
- Install an optional coolant valve always in the supply line of the vapour condenser only.

Permissible range of coolant temperature at the vapour condenser:  
-15°C to +20°C

Check hose connections prior to starting operation of the cooling system.  
Check coolant hoses regularly during operation.

Do not allow the catchpots to get overfilled. Maximum liquid level approx. 80% to avoid problems when removing the catchpots.

Check liquid level in both catchpots regularly and drain catchpots in time.

**Removing the catchpots:**

Catchpot / collecting flask at outlet:

Remove joint clip, remove catchpot and drain condensate.

Catchpot at inlet:

Admit air or inert gas (via pump inlet) to atmospheric pressure. Remove joint clip, remove catchpot and drain condensate.

- Reassemble drained catchpots.

**Important:** Comply with regulations when disposing of solvents/condensates. Re-use if possible, purify if contaminated.

For condensable vapours (water vapour, solvents, ...):

- ☞ Do not pump vapour before pump has reached its operating temperature and without inert gas gas ballast.
- ☞ Use inert gas at the gas ballast to avoid the formation of explosive mixtures.
- ☞ With gas ballast ultimate vacuum will be reduced
- ☞ Do not pump vapour before pump has reached its operating temperature

In case of low boiling solvents when the formation of condensate is unlikely, the use of gas ballast might be unnecessary.

- ☞ Operating the pump without gas ballast increases the solvent recovery rates at the vapour condenser.

The exhaust waste vapour condenser enables an efficient condensation of the pumped vapours at the outlet.

- ☞ Next to 100% solvent recovery.
- ☞ Install hoses for cooling water at the inlet and outlet (hose nozzle 6 mm), secure hose connections against gliding down.
- ☞ Ensure that the system design does not allow the coolant outlet pipeline to become blocked.

**⚠ WARNING**

- ☞ Ensure that the system design does not allow the exhaust pipeline to be blocked (hose nozzle 10 mm), do not permit uncontrolled pressurizing.
- ☞ Connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere.
- ☞ The pumped gases at the outlet of the pump or at the exhaust waste vapour condenser have to be drained under consideration of all applicable safety regulations.  
The user has to check the possibility of an explosive atmosphere at the outlet of the pump or the exhaust waste vapour condenser. Therefore for example calculate the solvent partial pressure at the present cooling water temperature at the exhaust waste vapour condenser and compare with the explosion limits of the pumped solvent. If there is an explosive mixture, drain the gas at the outlet in antistatic lines according to the valid explosion protection guidelines.

***During operation*****⚠ CAUTION**

- **Maximum ambient temperature:** 40 °C
- Make sure ventilation is adequate especially if the pump is installed in a housing or if the ambient temperature is elevated. Install an external automatic ventilation system if necessary.
- If the pump is installed in altitudes of more than 1000 m above mean sea level check compatibility with applicable safety requirements, especially IEC 60034 (motor might overheat due to insufficient cooling).
- ☞ **If the pump has been exposed to increased ambient temperature (> 40°C) check the pump for damage and perform a leak test if necessary (integral leak rate < 0.1 mbar\*l/s).**
- Potentially explosive mixtures at the outlet of the pump have to be drained appropriately.
- Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the max. permitted pressure compatible with the mechanical stability of the system.
- ☞ Check compatibility with max. permitted pressure at the inlet and the outlet and max. pressure difference between inlet and outlet ports.  
Ensure that the pump outlet is not blocked or restricted.

**⚠ WARNING**

**Do not start pump if pressure difference between inlet and outlet port exceeds max. 1 bar. Attempts to start pump at higher difference may cause blockade and damage of the motor.** Check compatibility with **maximally permitted pressure** at inlet and outlet.

Check the pump regularly at the outside for pollution or deposits, clean the pump if necessary to avoid increase of the operation temperature of the pump.

If pumping different substances purge the pump with inert gas prior to change the pumped media to pump out residues and to avoid reactions of the pumped substances with each other and the pump material.

Take into considerations interactions and chemical reactions of the pumped media.

The pump achieves its pumping speed, ultimate total vacuum and vapour pumping rate only at operating temperature (after approx. 15 minutes).

- ☞ Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amounts.
- ☞ Let the pump run with gas ballast to reduce condensation of pumped substances (water vapour, solvents, ....) in the pump.

## **⚠ WARNING**

The motor is protected by a thermal cutout with manual reset combined with an overcurrent protection.

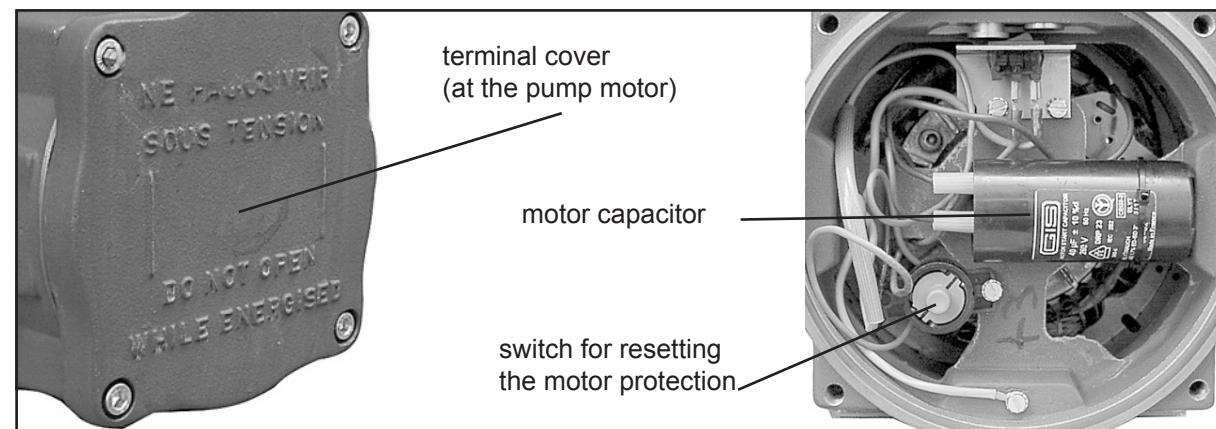
- ☞ Attention: Only manual reset is possible. Determine cause of switching off and eliminate. Allow sufficient cooling of the pump prior to switching on again (approx. 5 minutes).
- ☞ Reset of the pump must performed only by a suitably trained technician!
- ⇒ Separate the pump from mains and wait two minutes before opening the terminal until hot parts have discharged.  
Attention: Open the terminal only outside of explosive atmospheres and only by suitably trained personnel.
- ⇒ Unscrew the terminal cover from the pump motor.
- ⇒ Push the switch inside the terminal.
- ⇒ Screw the terminal cover correctly, screw tightening torque: 23 Nm.

## **⚠ WARNING**

**Attention:**

**Absolutely check the motor capacitor for leaks and capacity if the motor protection has been activated.**

**Check the complete pump for leaks in the gas line (integral leak rate < 0.1 mbar l / s)!**



## ***Shutdown***

### **NOTICE**

#### **Short-term:**

Has the pump been exposed to condensate?

Allow the pump to continue to run at atmospheric pressure for a few minutes.

Has the pump been exposed to media which may damage the pump materials or form **deposits**?

Check and clean pump heads if necessary.

#### **Long-term:**

Take measures as described in section short-term shutdown.

Separate pump from the apparatus.

Close inlet and outlet port (e. g. with transport caps).

Close the gas ballast valve.

Store the pump in dry condition

## Troubleshooting

**Never operate a defective pump!**  
**Read and obey the instructions for use!**

Fault	Possible cause	Remedy
<input type="checkbox"/> Pump does not start or stops immediately.	<ul style="list-style-type: none"> <li>➡ Mains not plugged in, electrical supply failure?</li> <li>➡ Pressure in outlet pipeline too high?</li> <li>➡ Motor overloaded?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Check power supply and fuse in the building installation.</li> <li>✓ Remove blockade in line, open valve.</li> <li>✓ Allow the motor to cool down, identify cause of failure and eliminate. Reset the motor protection and switch on the pump, see section above.</li> </ul>
<input type="checkbox"/> Pump does not achieve its ultimate vacuum or usual pumping speed.	<ul style="list-style-type: none"> <li>➡ Centring ring at small flange connection not correctly positioned or leak in the pipeline or vacuum system?</li> <li>➡ Long, narrow line?</li> <li>➡ Pump has been exposed to condensate?</li> <li>➡ Deposits have been formed inside the pump?</li> <li>➡ Diaphragms or valves damaged?</li> <li>➡ Outgassing substances or vapour generated in the process?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Check pump directly - connect vacuum gauge directly at pump inlet - then check connection, pipeline and vacuum system if necessary.</li> <li>✓ Use lines with larger diameter, length as short as possible.</li> <li>✓ Allow pump to run for some minutes with atmospheric pressure at the inlet.</li> <li>✓ Clean and inspect the pump heads.</li> <li>✓ Replace diaphragms and/or valves.</li> <li>✓ Check process parameters.</li> </ul>
<input type="checkbox"/> Pump too noisy. <b>Attention: Switch off pump immediately and inspect!</b>	<ul style="list-style-type: none"> <li>➡ Loud exhaust noise?</li> <li>➡ Diaphragm crack or diaphragm clamping disc loose?</li> <li>➡ Motor bearing defective?</li> <li>➡ Deposits have been formed inside the pump?</li> <li>➡ Diaphragms or valves defective?</li> <li>➡ Other than above mentioned causes?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Connect hose or silencer to pump outlet.</li> <li>✓ Perform maintenance.</li> <li>✓ Contact local distributor.</li> <li>✓ Clean and inspect pump heads.</li> <li>✓ Replace diaphragms and/or valves.</li> <li>✓ Contact local distributor.</li> </ul>
<input type="checkbox"/> Pump seized.		✓ Contact local distributor.

## Replacing diaphragms and valves

### NOTICE

All bearings are encapsulated and are filled with long-life lubricant and run under normal operating conditions maintenance free. Replacement of the bearing must be performed at the latest at 90% of the nominal lifetime of the bearing (nominal lifetime of the bearing: 40000 operation hours, if necessary provide an operation time counter). If the noise level is enhanced switch off the pump immediately and inspect. Replacement of the bearing must only be performed at the factory. Never operate a defective pump.

### NOTICE

The motor capacitors are wear parts. The motor capacitors have to be replaced after 200000 start/stop cycles at the latest. The capacitors have to be replaced only at the factory.

### NOTICE

The valves and the diaphragms are wear parts. Replace the diaphragms at the latest at 90% of the typical lifetime or immediately at higher noise level. The typical lifetime of a diaphragm is 15000 operation hours when pumping non-corrosive or non-condensable gases, if necessary provide an operation time counter.

Pumping condensable media, operation at high temperature, great gas flow or deposits reduce the lifetime of a diaphragm significantly. Therefore check the diaphragm regularly for faultless condition.

- ☞ Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amount.

### NOTICE

To control the faultless function of the diaphragm install a gas specific detector at the outlet of the inert gas flush. A signal from the detector indicates a diaphragm crack. Switch off the pump immediately and check diaphragms.

If the rated ultimate vacuum is no longer achieved, the pump interior, the hose connections, the diaphragms and the valves must be cleaned and the diaphragms and valves must be checked for cracks or other damage. Replace defective parts immediately.

### NOTICE

Inspect the fittings of the pump regularly, the maximum permitted leak rate is 0.1 mbar l / s.

When replacing diaphragms and valves check the overpressure safety valve at the outlet of the pump.

Remove possible deposits in the crank chamber of the pump when replacing diaphragms and valves.

If the pump is exposed to corrosive gases or gases and vapours which may form deposits (e. g. crystallisation) or deposits due to pumped particles, maintenance should be carried out frequently (according to the experience of the user).

- ☞ Regular maintenance will improve the lifetime of the pump and also protect both man and environment.



### WARNING

Before starting maintenance vent the system, isolate the pump and other components from the vacuum system and the electrical supply. Drain condensate if applicable, avoid the release of pollutants. Allow sufficient cooling of the pump. Before starting maintenance, wait two minutes after isolating the equipment from mains to allow the capacitors to discharge.

Never operate the pump if covers or other parts of the pump are disassembled. Ensure that the pump cannot be operated accidentally. Never operate a defective or damaged pump.

Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.

### CAUTION

Attention: The pump might be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

 Wear appropriate safety-clothing when you come in contact with contaminated components.

## NOTICE

 Please read section "Replacing diaphragms and valves" completely before starting maintenance.

Partially the pictures show pumps in other versions. This doesn't influence replacing diaphragms and valves of the pump.

## NOTICE

Attention:

The pump heads of VACUUBRAND ATEX diaphragm pumps are assembled in two different versions. This is only visible after disassembling the pump heads.

Replacing diaphragms and valves is described for both versions separately.

## NOTICE

If not using genuine spare parts the ATEX conformity becomes invalid.

Attention: Open the pump only outside of explosive atmospheres and only by suitably trained personnel.

Always replace both diaphragms of a pump head!

Always disassemble and assemble only one pump head before opening the next pump head. The single parts of a pump head are measured in a way so to avoid that the diaphragm clamping disc hits the head cover. Never mix parts of different pump heads or add or leave out washers.

We recommend to replace all diaphragms and valves of a pump at the same time.

## Spare parts

### Set of seals (diaphragms, valves, O-rings)

MZ 2C EX / MZ 2C EX + AK + EK / MZ 2C EX + IK + EK .....	1 x 696837
MD 4C EX / MD 4C EX + AK + EK .....	2 x 696837
MV 10C EX / MV 10C EX + AK + EK .....	4 x 696837

Sealing bond (PTFE) ..... 637514

Valve (one piece) ..... 637225

(internal overpressure valve in MD 4C EX, MD 4C EX + AK + EK, MV 10C EX, MV 10C EX + AK + EK)

O-Ring 28 x 2.5 ..... 635628

at the spherical ground joint of the catchpot at the inlet

Flat seal (overpressure safety valve at the outlet) ..... 637081

Spring (overpressure safety valve at the outlet) ..... 637065

## Version 1



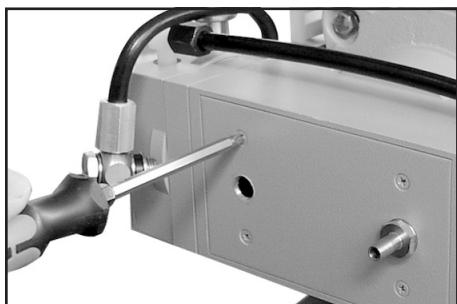
### Tools required (metric):

- Phillips screw driver size 2
- Open-ended wrench size 10/15/17
- Hex key size 5
- Face wrench with torque indicator  
(fig. VACUUBRAND face wrench cat. no.: 637580)

### Cleaning and inspecting the pump heads



- Use open-ended wrench to unscrew the inert gas fitting at the housing cover.



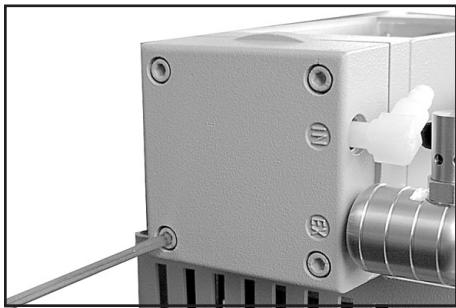
- Unscrew the housing plate from the pump.



- Unscrew the union nut at the elbow fitting of the pump head and remove hose.
- Turn the fittings as little as possible and do not remove the fittings from the pump head.  
Through reassembly a leak may result.



- Position the pump on the motor.  
Unscrew the locking plate at the inert gas connection and remove hose.



- ▶ Use hex key to remove four socket head screws from pump head and remove upper housing (housing cover with housing cover insert and head cover).
- ☞ Never remove parts by using a spiky or sharp-edged tool (e. g. screw driver), we recommend to use a rubber mallet or compressed air (to be blown carefully into port).
- ▶ Carefully remove head cover from housing cover insert and check valves. Note position of valves and remove.
- ☞ Replace valves if necessary.
- ☞ Use petroleum ether or industrial solvent to remove deposits. Do not inhale.

## Replacing the diaphragm



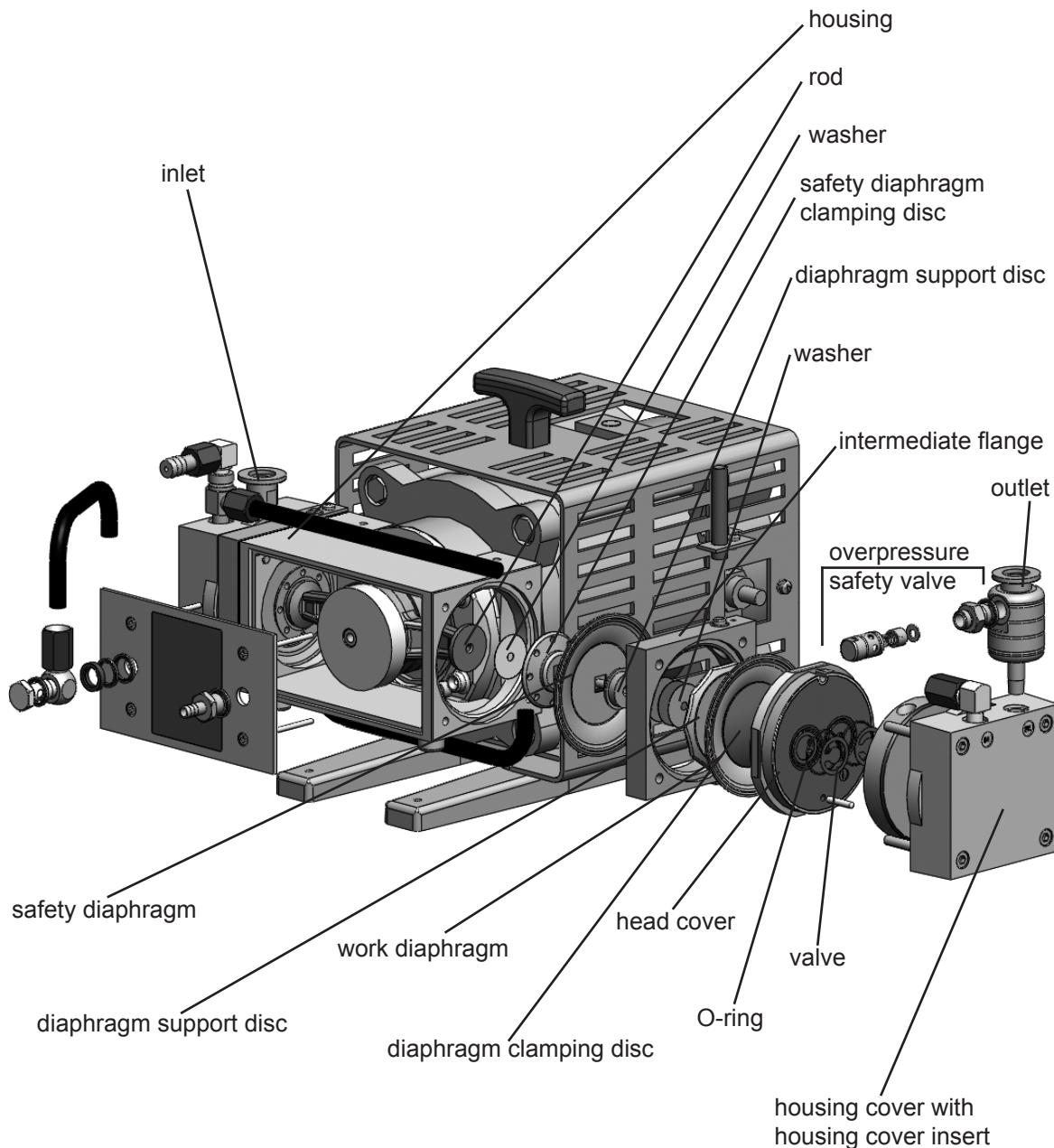
- ▶ Use a face wrench to remove diaphragm support disc.
- ▶ Check for washers under clamping disc. Do not mix the washers from the different heads. Make sure that the original number and thickness of washers is reassembled at the individual pump head.
- ▶ Never increase the amount of washers.  
Risk of temperature increase!  
Risk of explosion!

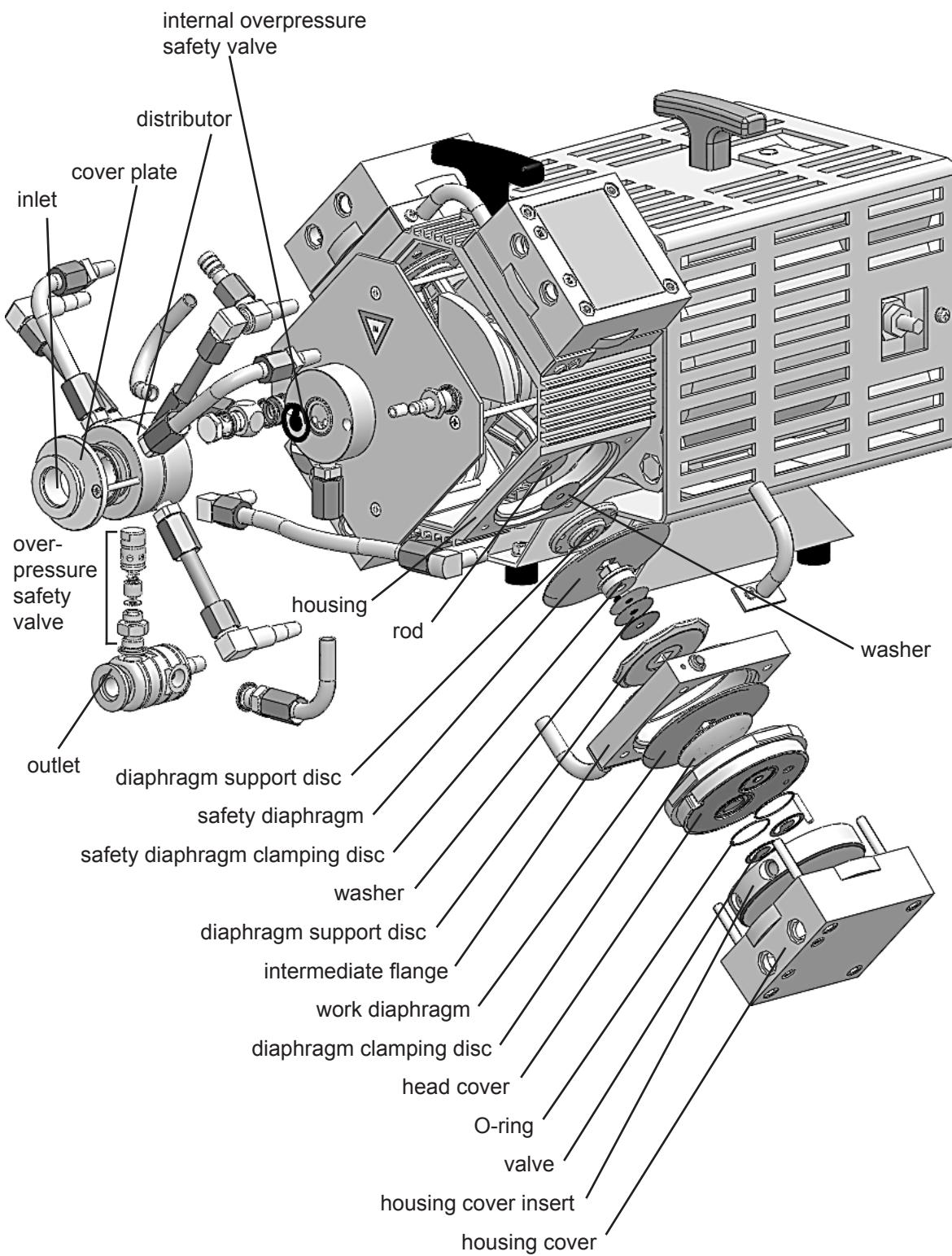
**DANGER**

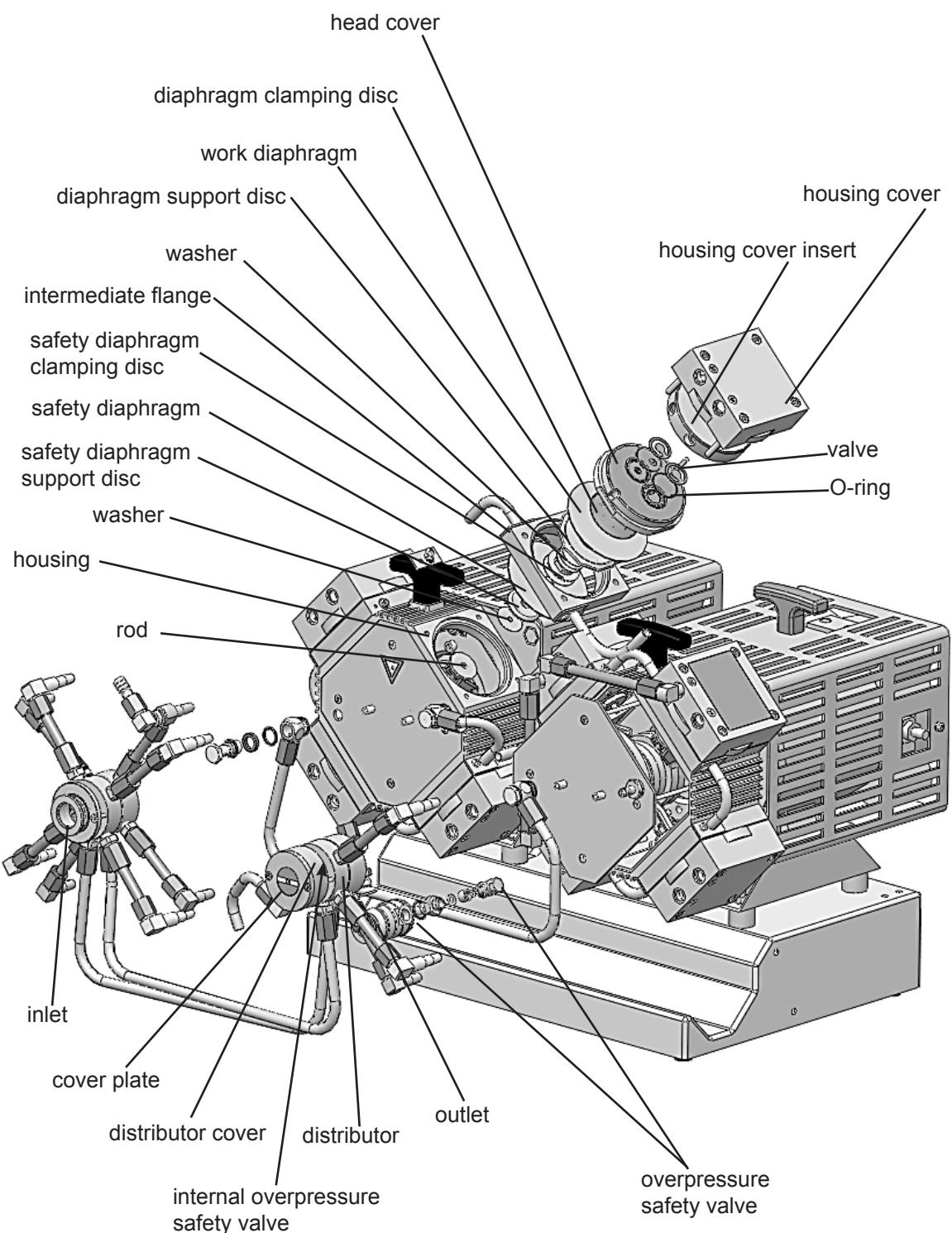


- ▶ Remove the intermediate flange with clamping discs, diaphragms and diaphragm support discs from the pump housing.

Remove the diaphragm support disc of the safety diaphragm and safety diaphragm.

**View of the disassembled pump head parts (fig. MZ 2C EX)**

**View of the disassembled pump head parts (fig. MD 4C EX)**

**View of the disassembled pump head parts (fig. MV 10C EX)**



- Use the metal face wrench to disassemble diaphragm clamping disc, diaphragm and diaphragm support disc (use a open-ended wrench to fix the components).

Before reassembling ensure that all parts are clean, dry and lint free, especially the valve seat. Remove residual adhesive.



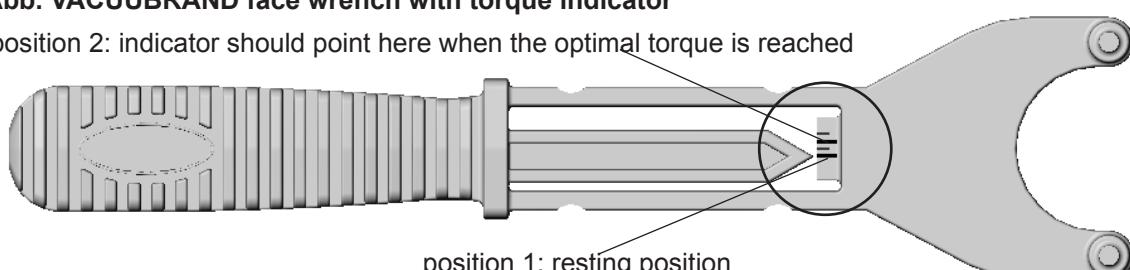
- Position new diaphragm between diaphragm clamping disc with square head screw and diaphragm support disc.
- ☞ Attention: Position diaphragm with white PTFE side to diaphragm clamping disc (to pump chamber).
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- Use a face wrench with torque indicator to assemble diaphragm clamping disc, diaphragm and diaphragm support disc with safety diaphragm clamping disc (use a open-ended wrench to fix the components).
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.

Optimum torque for the diaphragm support disc: 6 Nm.

- ☞ The optimum torque is reached when the pointer in the handle of the VACUUBRAND face wrench points to position 2 which is the long line between the two shorter lines. Do not tighten over 6 Nm!
- ☞ Ensure conductance of the connection.

#### Abb. VACUUBRAND face wrench with torque indicator

position 2: indicator should point here when the optimal torque is reached



position 1: resting position



- Position diaphragm clamping disc, diaphragm and diaphragm support disc with safety diaphragm clamping disc in the intermediate flange from the side which has a deepening as guidance for the diaphragm. Position safety diaphragm and safety diaphragm support disc from the other side.
- ☞ Attention: Position diaphragm with the light side towards the pump chamber.  
Ensure correct position of the diaphragm support disc (see also exploded drawing). Assemble the side with the smaller bearing surface towards the diaphragm.



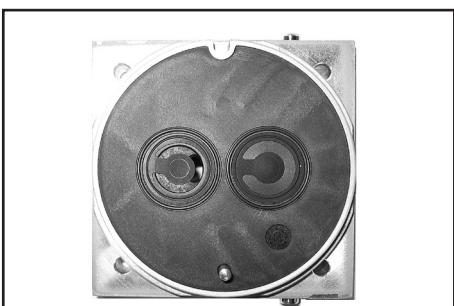
- ▶ Use a face wrench with torque indicator to assemble safety diaphragm support disc under the safety diaphragm with rod.

**☞ Attention: Absolutely assemble all washers correct if available (between safety diaphragm support disc and rod). Never assemble more washers!**

**⚠ DANGER**

- ▶ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support discs.  
Optimum torque for the diaphragm support disc: 6 Nm.
- ▶ The optimum torque is achieved if the pointer in the handle of the VACUUBRAND face wrench shows to the longer marking line (see above).
- ▶ Ensure conductance of the connection.

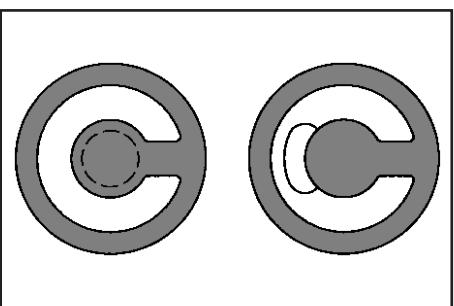
## Assembling the pump head



- ▶ Position pump in a way so that the disassembled pump head is above, support if necessary.
- ▶ By turning eccentric bushing (front of connecting rod), bring connecting rod into a position in which diaphragm is in contact with housing and centred with respect to bore.

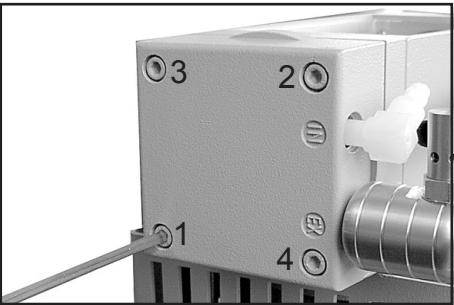
Reassemble in reverse order.

- ▶ Install head cover with O-ring, valves and housing cover with housing cover insert.



- ☞ Make sure that the valves are correctly seated: Valves at the outlet with round centred opening under valve, valves at the inlet with kidney-shaped opening beside valve.

- ☞ Ensure that the diaphragm is positioned centrally so that it will become clamped uniformly between housing and head cover.

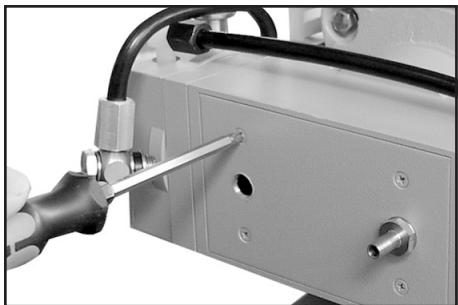


- ▶ Screw in four socket head screws fixing housing cover crosswise (e. g. in the sequence 1,2,3,4) first slightly, then tighten.

- ☞ Do not tighten until head cover is in contact with housing, torque 12 Nm.

**Attention: Ensure that the diaphragm clamping disc never hits the head cover! In case of loud knocking switch off the pump immediately.**

Inspect pump or replace diaphragms and valves at the other pump heads analogue.



- Screw housing plate to pump.

### Individual performance check of a pump head



- Measure the pressure at the inlet port of the individual head: Use a suitable vacuum gauge (e. g. DVR 2, cat. no.: 682902), make sure that it is correctly calibrated, and measure the pressure at the inlet port. A vacuum of less than 120 mbar should be indicated.
- ☞ If the reading is higher, recheck the pump chamber and make sure that the valves and the diaphragms are correctly seated (diaphragms concentric with bore).

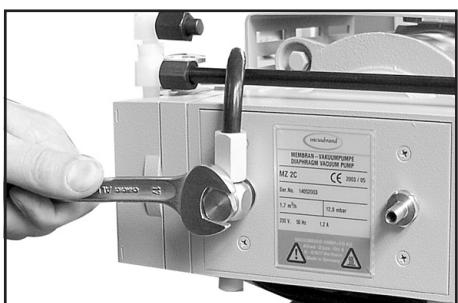
### Assembling fittings



- Position pump on pump feet.
- Connect hose to elbow fitting.
- Tighten union nuts first by hand and then tighten one full turn using open ended wrench.



- Position the pump on the motor. Attach hose to the inert gas connection and screw the locking plate.



- Use open-ended wrench to screw the inert gas fitting at the housing cover.

**DANGER**

**Attention: Perform a leak test always after opening the pump by using an appropriate leak detector (e. g. helium leak detector)!**

**Ensure that the diaphragm clamping disc never hits the head cover while pump is running! Noise check!**

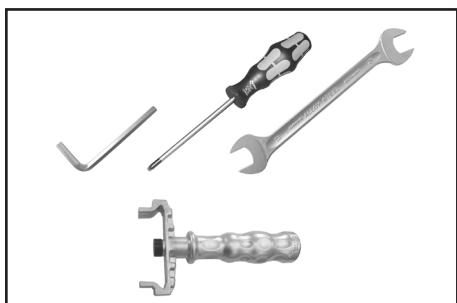
If the pump does not achieve the ultimate pressure:

- ☞ In case the diaphragms and valves have been replaced, a run-in period of several hours is required before the pump achieves its ultimate vacuum.

If all pump heads achieve a vacuum below 120 mbar but pump does not achieve the ultimate total pressure:

Check hose connectors between pump heads and manifolds for leaks. If necessary recheck pump chamber.

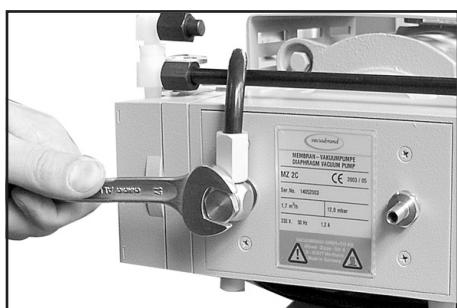
## Version 2



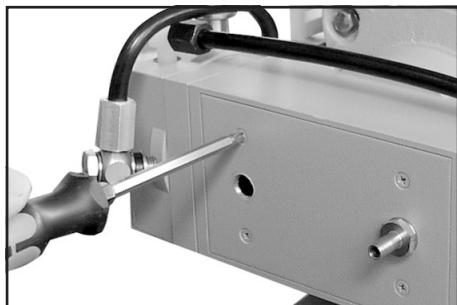
### Tools required (metric):

- Phillips screw driver size 2
- Open-ended wrench size 10/15/17
- Open-ended wrench size 19, 4.5 mm thick
- Torque wrench size 19
- Hex key size 5
- Diaphragm key SW 66 (cat. no.: 636554)
- Open-ended wrench size 19 with torque indicator

### Cleaning and inspecting the pump heads



► Use open-ended wrench to unscrew the inert gas fitting at the housing cover.



► Unscrew the housing plate from the pump.

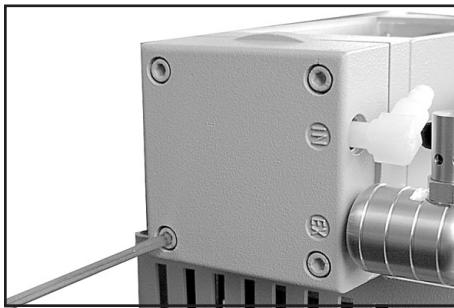


► Unscrew the union nut at the elbow fitting of the pump head and remove hose.

☞ Turn the fittings as little as possible and do not remove the fittings from the pump head.  
Through reassembly a leak may result.



► Position the pump on the motor.  
Unscrew the locking plate at the inert gas connection and remove hose.

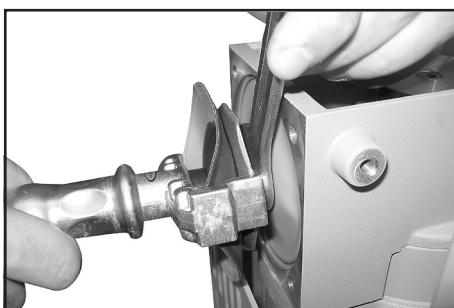


- ▶ Use hex key to remove four socket head screws from pump head and remove upper housing (housing cover with housing cover insert and head cover).
- ☞ Never remove parts by using a spiky or sharp-edged tool (e. g. screw driver), we recommend to use a rubber mallet or compressed air (to be blown carefully into port).
- ▶ Carefully remove head cover from housing cover insert and check valves. Note position of valves and remove.
- ☞ Replace valves if necessary.
- ☞ Use petroleum ether or industrial solvent to remove deposits. Do not inhale.

### Replacing the diaphragm

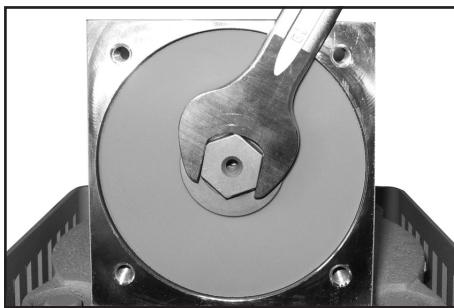


- ▶ Remove intermediate flange by hand.

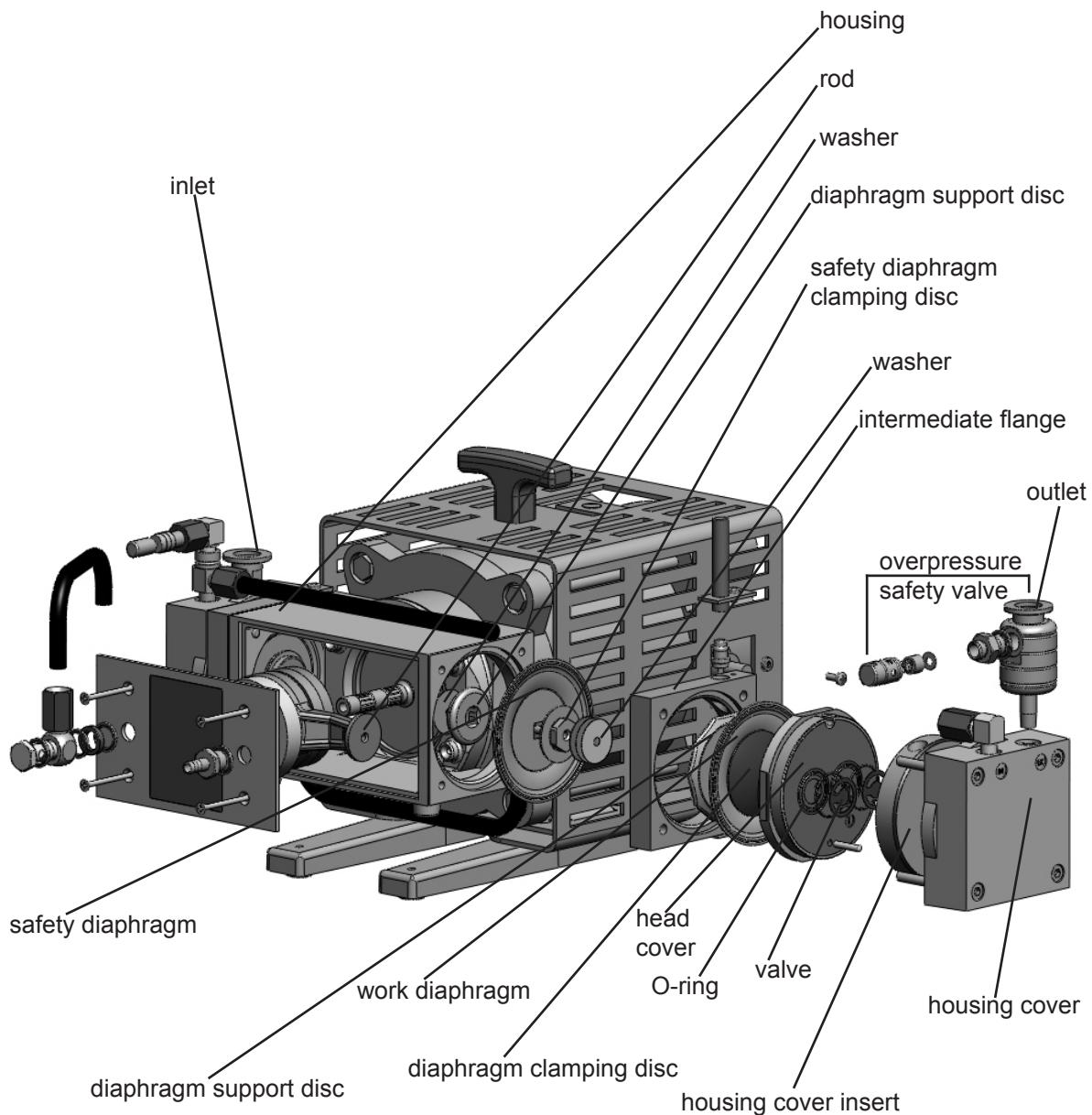


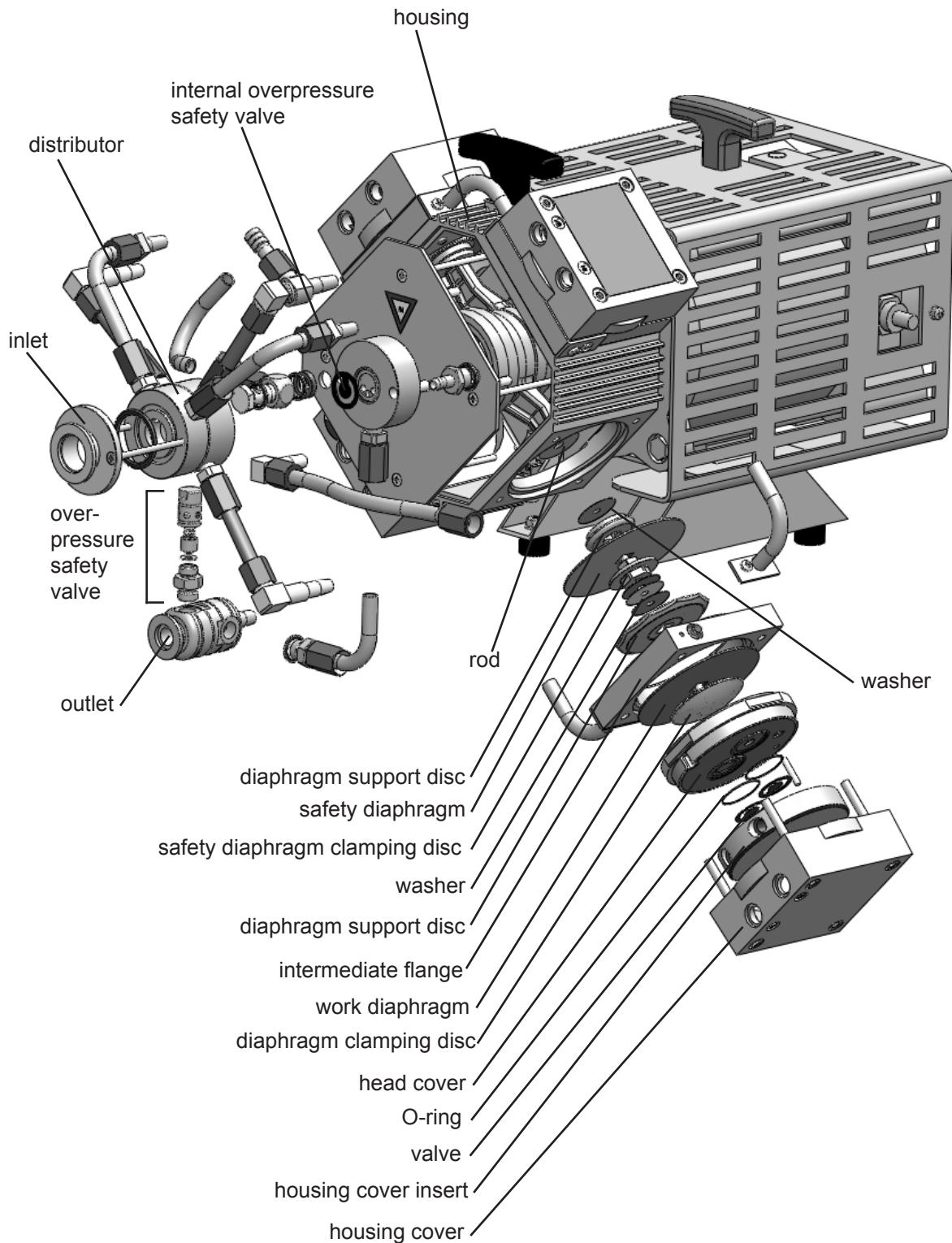
- ☞ Check diaphragm for damage and replace if necessary.
- ▶ Lift diaphragm carefully sidewise.
- ☞ Never use a spiky or sharp-edged tool to lift the diaphragm.
- ▶ Use the diaphragm key to grip the diaphragm support disc below the diaphragm.
- ▶ Unscrew diaphragm support disc with diaphragm and diaphragm clamping disc.

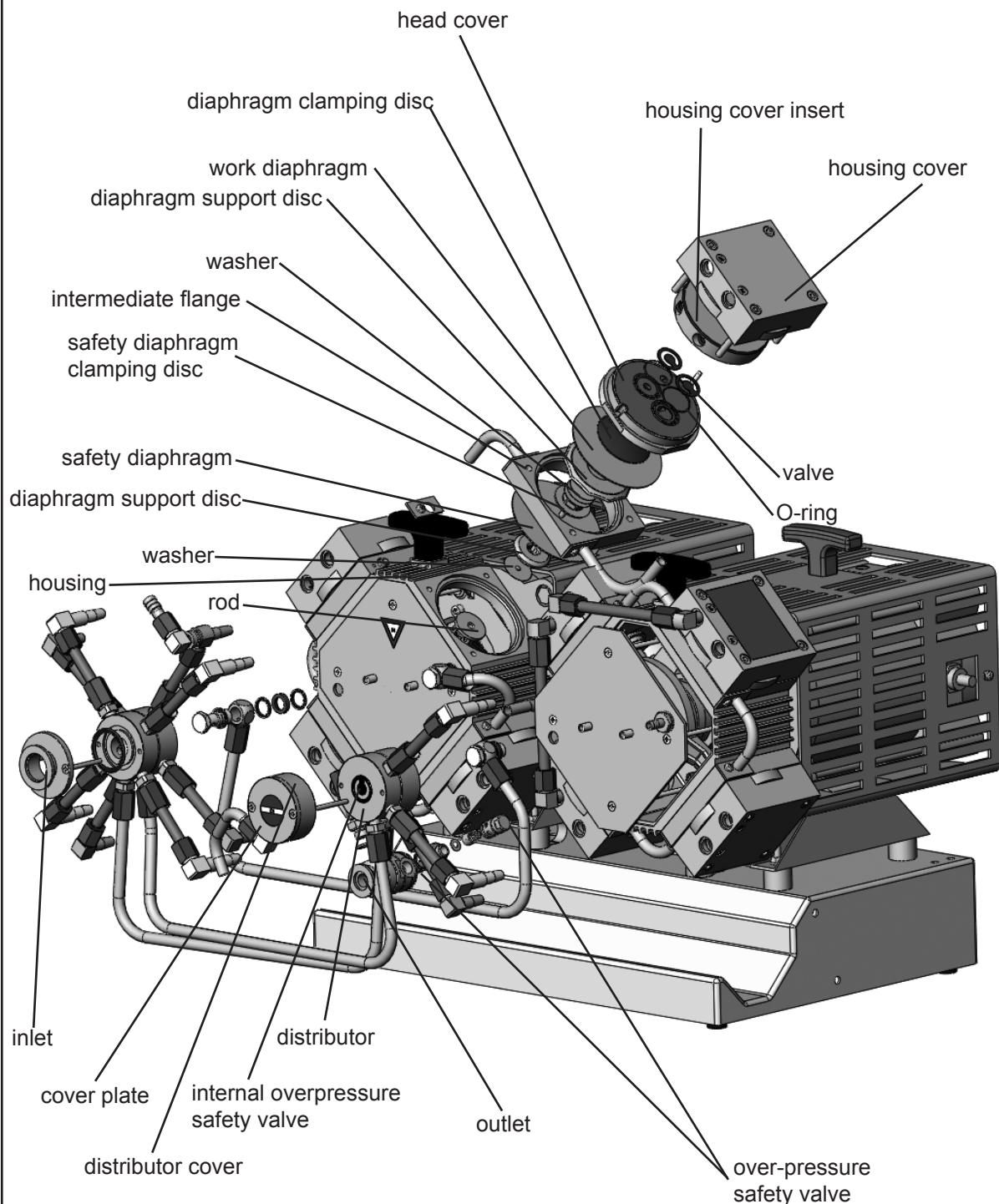
- ▶ Never increase the amount of washers.  
Risk of temperature increase!  
Risk of explosion!

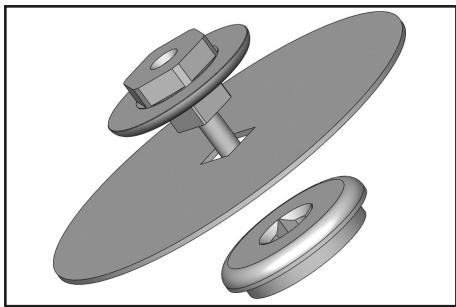


- ▶ Remove clamping disc of the safety diaphragm with an open-ended wrench and remove together with safety diaphragm and support disc.

**View of the disassembled pump head parts (fig. MZ 2C EX)**

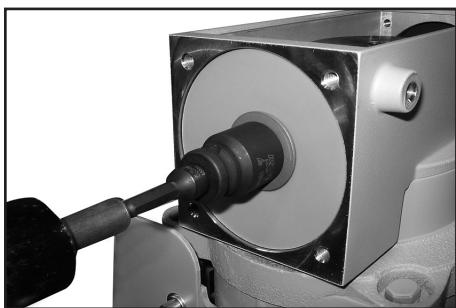
**View of the disassembled pump head parts (fig. MD 4C EX)**

**View of the disassembled pump head parts (fig. MV 10C EX)**




Before reassembling ensure that all parts are clean, dry and lint free, especially the valve seat.

- Position new safety diaphragm between safety diaphragm clamping disc and safety diaphragm support disc.
- ☞ Attention: Position diaphragm with pale side towards diaphragm clamping disc.
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.



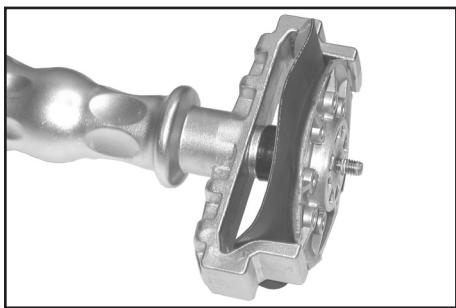
Use torque wrench w/f 19 to screw safety diaphragm support disc, safety diaphragm and safety diaphragm clamping disc to rod.

- ☞ Attention: Absolutely assemble all washers correctly if available (between safety diaphragm support disc and rod). Never assemble more washers!

**DANGER**

- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.

Optimum torque for the safety diaphragm clamping disc: **6 Nm**.



- Position new work diaphragm between diaphragm clamping disc with square head screw and diaphragm support disc.

- ☞ Attention: Position diaphragm with pale side towards diaphragm clamping disc (to pump chamber).
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.

- Lift diaphragm at the side and position carefully together with diaphragm clamping disc and diaphragm support disc in the diaphragm key.

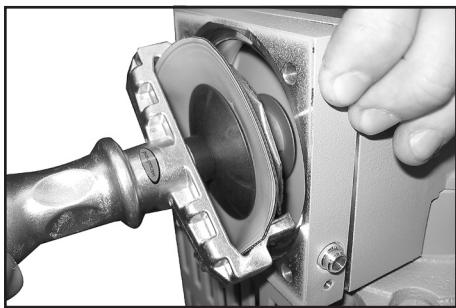
- ☞ Avoid damage of the diaphragm: Do not bend diaphragm too much.

- Position intermediate flange to housing.

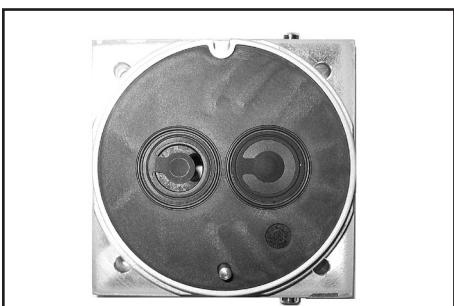
- Screw diaphragm clamping disc, diaphragm, diaphragm support disc and washers to connecting rod.

- Optimum torque for the diaphragm support disc: 6 Nm, it is recommended to use a torque key. Attach hex key to diaphragm key (hexagonal bolt 6 mm wide).

**Attention:** Never use the diaphragm key with any additional tools like tongs or hex keys without torque limitation.



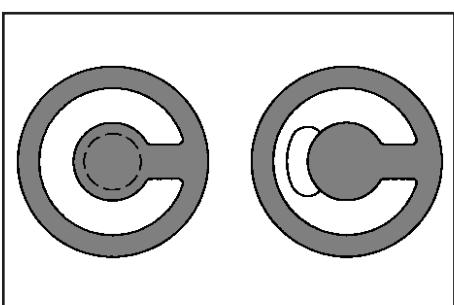
## Assembling the pump head



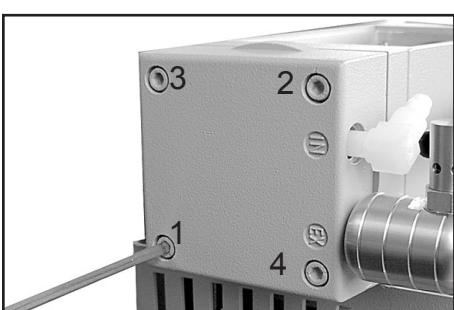
- Position pump in a way so that the disassembled pump head is above, support if necessary.
- By turning eccentric bushing (front of connecting rod), bring connecting rod into a position in which diaphragm is in contact with housing and centred with respect to bore.

Reassemble in reverse order.

- Install head cover with O-ring, valves and housing cover with housing cover insert.



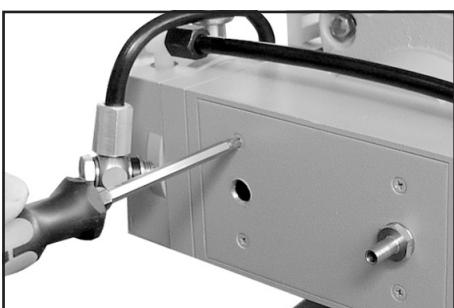
- ☞ Make sure that the valves are correctly seated: Valves at the outlet with round centred opening under valve, valves at the inlet with kidney-shaped opening beside valve.
- ☞ Ensure that the diaphragm is positioned centrally so that it will become clamped uniformly between housing and head cover.



- Screw in four socket head screws fixing housing cover crosswise (e. g. in the sequence 1,2,3,4) first slightly, then tighten.
- ☞ Do not tighten until head cover is in contact with housing, torque 12 Nm.

**Attention: Ensure that the diaphragm clamping disc never hits the head cover! In case of loud knocking switch off the pump immediately.**

Inspect pump or replace diaphragms and valves at the other pump heads analogue.



- Screw housing plate to pump.

## Individual performance check of a pump head



- Measure the pressure at the inlet port of the individual head: Use a suitable vacuum gauge (e. g. DVR 2, cat. no.: 682902), make sure that it is correctly calibrated, and measure the pressure at the inlet port. A vacuum of less than 120 mbar should be indicated.
- ☞ If the reading is higher, recheck the pump chamber and make sure that the valves and the diaphragms are correctly seated (diaphragms concentric with bore).

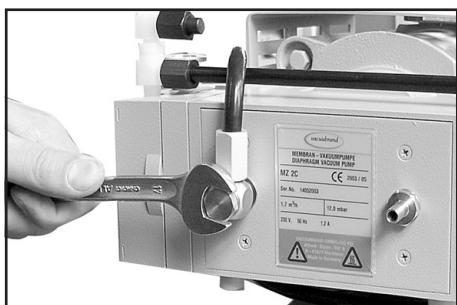
## Assembling fittings



- ▶ Position pump on pump feet.
- ▶ Connect hose to elbow fitting.
- ▶ Tighten union nuts first by hand and then tighten one full turn using open ended wrench.



- ▶ Position the pump on the motor.  
Attach hose to the inert gas connection and screw the locking plate.



- ▶ Use open-ended wrench to screw the inert gas fitting at the housing cover.

## DANGER

**Attention: Perform a leak test always after opening the pump by using an appropriate leak detector (e. g. helium leak detector)!**

**Ensure that the diaphragm clamping disc never hits the head cover while pump is running! Noise check!**

If the pump does not achieve the ultimate pressure:

- ☞ In case the diaphragms and valves have been replaced, a run-in period of several hours is required before the pump achieves its ultimate vacuum.

If all pump heads achieve a vacuum below 120 mbar but pump does not achieve the ultimate total pressure:

Check hose connectors between pump heads and manifolds for leaks. If necessary recheck pump chamber.

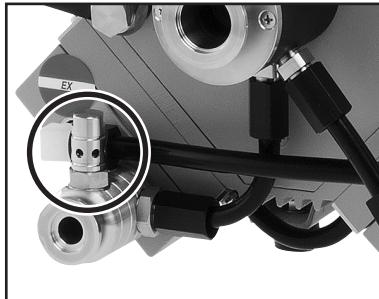
## Inspecting the overpressure safety valve

### Inspecting the overpressure safety valve at the outlet:

- Unscrew the overpressure safety valve at the outlet of the pump.



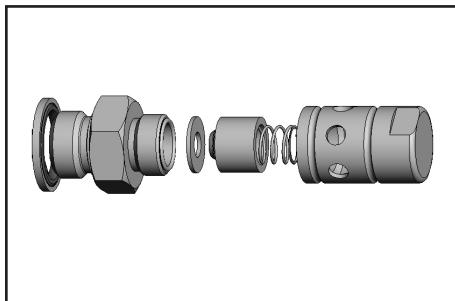
MZ 2C EX



MD 4C EX

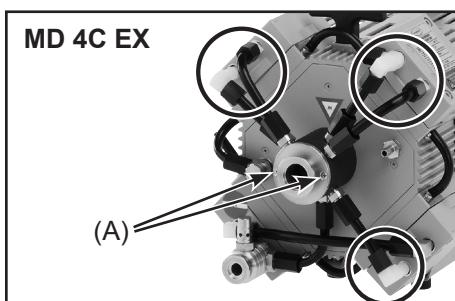


MV 10C EX



- Disassemble the overpressure safety valve and inspect the parts for faultless condition, replace damaged parts.
- Reassemble the valve correctly.
- Screw the overpressure safety valve to the outlet of the pump.

### Inspection and replacement of the internal overpressure safety valve at the manifold: (only MD 4C EX / MD 4C EX + AK + EK)



MD 4C EX

- Use an open-ended wrench (width 17 mm) to unscrew at the pump heads the union nuts of the tubings which are connected to the manifold (5x).

#### Elbow fitting (3x):

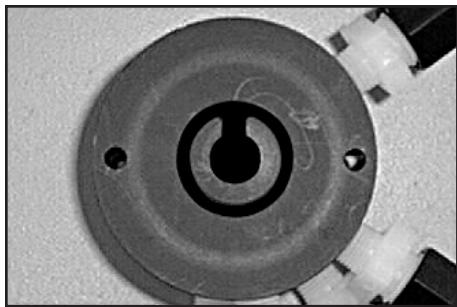
- Turn the fitting with an open-ended wrench (width 14 mm) to detach the tubing from the pump head (1/4 of a turn at maximum).

☞ Do not remove the elbow fitting from the pump head.

#### Straight fitting (2x):

- Pull the tubing off the fitting.

- Unscrew the two countersunk screws (A) at the cover plate and remove cover plate together with distributor and tubing.



- ▶ Note position of valve and remove.
- ☞ Check valve for damage and replace if necessary. Make sure that the valve is correctly seated.
- ▶ Reassemble distributor and cover plate.

Elbow fitting (3x):

- ▶ Slip the tubing onto the elbow fitting by turning the fitting with an open-ended wrench (width 15 mm).

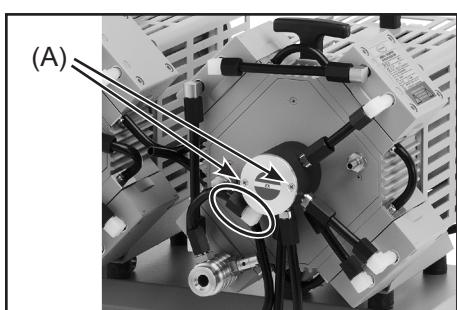
Straight fitting (2x):

- ▶ Slip the tubing onto the fitting.

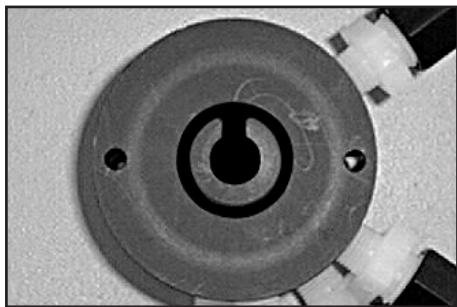
- ▶ Tighten union nuts first by hand and then tighten **one** full turn using the open ended wrench (width 17 mm).

### **Inspection and replacement of the internal overpressure safety valve at the manifold at the outlet:**

**(only MV 10C EX / MV 10C EX + AK + EK)**



- ▶ Use an open-ended wrench (width 17 mm) to unscrew at the pump head the union nut of the tubing which is connected to the outlet.
- ▶ Turn the fitting with an open-ended wrench (width 14 mm) to detach the tubing from the fitting (1/4 of a turn at maximum).
- ☞ Do not remove the elbow fitting from the distributor cover.
- ▶ Unscrew the two countersunk screws (A) at the cover plate and remove cover plate together with distributor cover.



- ▶ Note position of valve and remove.
- ☞ Check valve for damage and replace if necessary. Make sure that the valve is correctly seated.
- ▶ Reassemble distributor cover and cover plate.
- ▶ Slip the tubing onto the elbow fitting by turning the fitting with an open-ended wrench (width 15 mm).
- ▶ Tighten union nut first by hand and then tighten **one** full turn using the open ended wrench (width 17 mm).

## Notes on assembling fittings

The threads of the fittings at the pump heads might be sealed with PTFE bond (width 10 mm or 5 mm, thickness 0.1 mm).

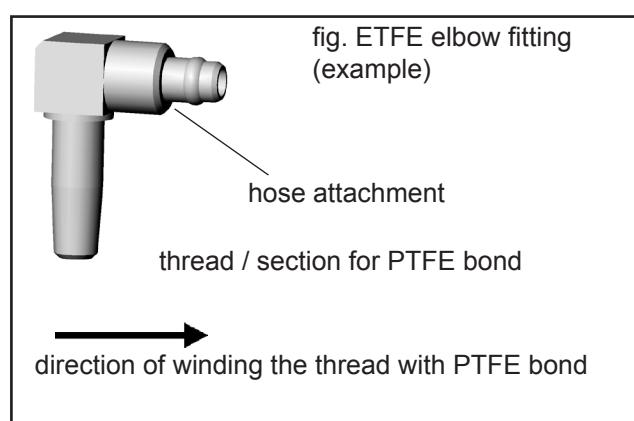
If the fittings are turned or have been removed, use new PTFE bond when reassembling.

If not using new fittings clean the thread of the fittings from PTFE bond.

Wind the thread of the fitting two times against the direction of turning in (anticlockwise) with PTFE bond.

Tighten the PTFE bond firmly. Ensure that the PTFE bond ends flush with the fittings. Ensure that the PTFE bond not covers the openings in the elbow fittings.

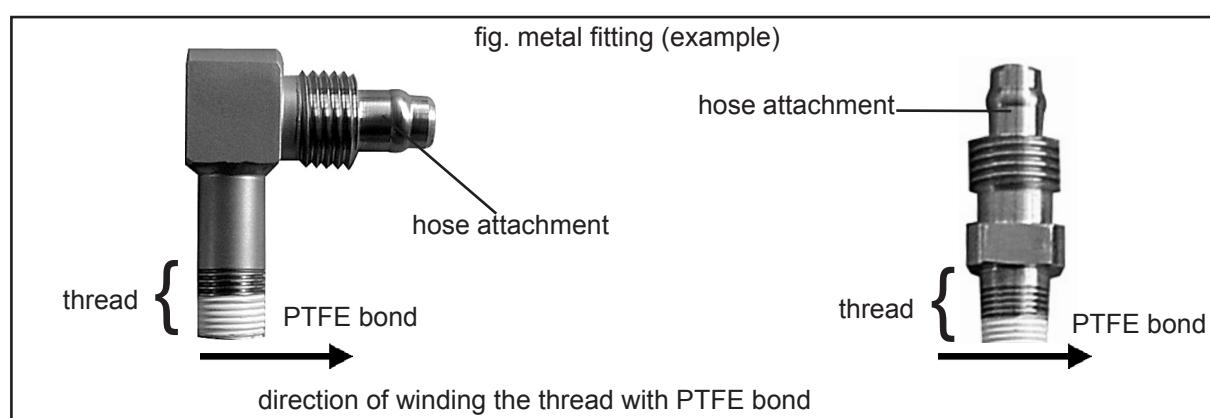
Screw in elbow fittings (clockwise) until only half of a thread course is visible. Do not overtighten. Avoid canting of the thread.



## **DANGER**

Seal only the lower half of the thread of the stainless steel fittings with PTFE bond (width 5 mm), see figure. Sealing the complete thread with PTFE bond leads to interruption of the conductive connection!

Never seal the hose attachment of metal fittings with PTFE bond.



## Notes on return to the factory

### Repair - return - DAkkS calibration

#### NOTICE

Safety and health of our staff, laws and regulations regarding the handling of dangerous goods, occupational health and safety regulations and regulations regarding safe disposal of waste require that for all pumps and other products the "**Health and safety clearance form**" must be sent to our office fully completed and signed before any equipment is shipped to the authorized service center.

Fax or mail a completed copy of the health and safety clearance form to us in advance. The declaration must arrive before the equipment. **Enclose a second completed copy with the product.** If the equipment is contaminated, you must notify the carrier.

**No repair / DAkkS calibration is possible unless the correctly completed form is returned. Inevitably, there will be a delay in processing the equipment if information is missing, or if this procedure is not followed.**

If the product has come in contact with chemicals, radioactive substances or other substances dangerous to health or environment, the product must be decontaminated **prior to sending it back to the service center.**

- Return the product to us **disassembled and cleaned** and accompanied by a certificate verifying decontamination or
- Contact an industrial cleaning and **decontamination service** directly or
- Authorize us to send the product to an industrial cleaning facility **at your expense.**

To expedite repair and to reduce costs, please enclose a detailed description of the problem and the product's operating conditions with every product returned for repair. We submit **repair quotations** only on request and always at the customer's expense. If an order is placed, the costs incurred for problem diagnosis are offset from the costs for repair or from the purchase price, if the customer prefers to buy a new product instead of repairing the defective one.

- **If you do not wish a repair on the basis of our quotation, the equipment may be returned to you disassembled and at your expense.**

In many cases, the **components must be cleaned in the factory** prior to repair. For cleaning we use an environmentally friendly water based process. Unfortunately the combined attack of elevated temperature, cleaning agent, ultrasonic treatment and mechanical stress (from pressurised water) may result in damage to the paint. Please mark in the health and safety clearance form if you wish a **repaint at your expense** just in case such a damage should occur.

We will also replace parts for cosmetic reasons at your request and at your expense.

#### NOTICE

**Before returning** the equipment ensure that (if applicable):

- Oil sealed pumps: Oil has been drained and an adequate quantity of fresh oil has been filled in to protect against corrosion. Dispose according to regulations.
- Equipment has been cleaned and/or decontaminated (inside and outside).
- All inlet and outlet ports have been capped.
- Equipment has been properly packed, (if necessary, please order original packaging materials at your costs), marked appropriately and notify the carrier of any possible contamination.
- The completed health and safety declaration is enclosed.

We thank you in advance for your understanding the necessity for these measures that protect our employees, and ensure that your device is protected in shipment.

#### Scraping and waste disposal:

Dispose of the equipment and any components removed from it safely in accordance with all local and national safety and environmental requirements. Particular care must be taken with components and waste oil which have been contaminated with dangerous substances from your processes. Do not incinerate fluoroelastomer seals and O-rings.

- You may authorize us to dispose of the equipment **at your expense.**

# Health and safety clearance form



**Devices will not be accepted for any handling before we have received this declaration.**

**Please read and comply with "Notes on return to the factory".**

**Oil filled pumps: Drain oil prior to shipping absolutely!**

1. Device (Model): ..... 2. Serial no.: .....

3. Reason for return / malfunction:

.....  
4. Has the device been used in a copper process step (e.g., semiconductor production).

yes  no

5. Substances (gases, liquids, solids) in contact with the device / which have been pumped:

.....  
.....  
.....  
.....

6. Prior to return to the factory the device has been decontaminated.  yes  no  
Description of the decontamination method and the test / verification procedure:  
.....  
.....

7. The device is free of hazardous, harmful substances.  yes  no

8. Protective measures required for VACUUBRAND employees:

.....  
9. If the paint is damaged, we wish a repaint or a replacement of parts for reason of appearance (repaint and replacement at customer's expense).  yes  no

## 10. Legally binding declaration

We assure for the returned device that all substances, which have been in contact with the device are listed in section 5 and that the information is complete and that we have not withheld any information. We declare that all measures - where applicable - have been taken listed in section "Return to the factory".

By our signature below, we acknowledge that we accept liability for any damage caused by providing incomplete or incorrect information and that we shall indemnify VACUUBRAND from any claims as regards damages from third parties. We are aware that as expressed in § 823 BGB (Public Law Code of Germany) we are directly liable for injuries or damages suffered by third parties, particularly VACUUBRAND employees occupied with handling/repairing the product.

Shipping of the device must take place according to regulations.

Name: ..... Signature: .....

Job title: ..... Company's seal: .....

Date: .....

Release for repair grant by VACUUBRAND (date / signature): .....

**„INSTRUCTIONS MANUAL“ for motors with mark „EEX“**

ELNOR MOTORS NV

**INSTRUCTIONS MANUAL: EXPLOSION PROOF MOTORS****INTRODUCTION**

An explosion-proof, and in particular a flameproof motor, is one that is inherently safe when working in potentially explosive atmospheres.

This means that its construction and assembly are designed so that ingress of explosive gases is rendered harmless for the environment.

In the event of accidental ignition, provoking an explosion inside the motor housing, the motor shell and brackets are strong enough to resist the internal pressure created by this explosion.

Moreover, assembly joints and shaft clearance must be long enough and offer minimum play, so that hot gases resulting from an explosion will be cooled sufficiently to create no possibility of an explosion outside the motor.

The outside temperature of the motor enclosure must also be kept well below the flash point of the gases present in the hazardous atmosphere, both in normal and abnormal working conditions.

Finally, it is the manufacturer's concern that components inside the motor should be able to withstand an occasional explosion without being adversely affected.

The degree of risk is dependant on the constituents of the hazardous atmosphere: even combustible dust can become explosive when spread in the air in the right proportion.

Therefore, existing risks have been divided into categories, depending on the temperature at which the gas or vapour mixtures become flammable, and also on their explosive energy.

For each of these, specific safety rules have been evolved on a European level.

Compliance with these rules is verified by an Ex notified body, approved for certification in accordance with article 9 of the European Community Council directive, no 94/9/CEE of 23 march 1994.

Certification delivered by any of the notified bodies is automatically valid in all CEE countries. It is recognised by all European adherent countries and also very seriously considered in many countries overseas, U.S.A. included.

In Belgium, it is the "Institut Scientifique de Service Public", in short ISSeP, which has been chosen for its long experience in problems of safety in mining industries.

As explosion proof motors are constructed with special materials and technologies that comply with the legal regulations concerning potentially explosive atmospheres, a wrong connection or a minor modification of the motor destroys the compliance with security regulations. The rules concerning explosion proof apparatus must be observed unconditionally. Note that our motors are approved for a specific group of hazardous areas and temperature classes.

**USE OF EExd MOTORS**

The user is responsible for the choice of the type of explosion proof motor. He has to take into account the explosion risks area in which the motor will run (classification of hazardous areas, temperature class,...).

Before installation, the user has to check if the group and protection class, marked on the motor label, corresponds with the requested conditions.

**INCOMING INSPECTION**

Inspect the motor to detect any signs of damage during the transport.

Check that the motor nameplate data complies with your order or specification. In the unlikely event of a claim, please contact our Sales Office.

ELNOR MOTORS NV

## STORAGE

The motor should be stored in a clean, dry and vibrations free environment. If the motor is to be stored for a long period of time, the machined surfaces protected with anti-rust coating should be checked and "touched up" if necessary.

If the motor is fitted with anti-condensation heaters, these should be connected during the storage period.

## MOUNTING AND START UP

Electric data of the motor, valid for the rated power, can be found on the nameplate.

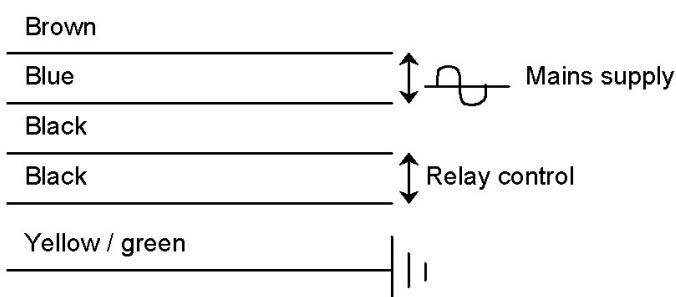
It is the responsibility of the user to ensure that the motor nameplate voltage and frequency are the same as the mains supply.

Connection to the mains supply should only be executed by a recognised professional, respecting local demands and regulations.

The user must ensure that the diameter of the cable is adequate for the voltage and current involved. (See nameplate data of motor)

The connection of the wires must be done as described in the connection diagram that is delivered with the motor. The connection diagram is usually located inside the cover of the terminal box. If the motor does not have a terminal box, it is located on the housing or attached to the cable.

The connection diagram is structured as follows: (see example)



The leads can be coloured or numbered. Each line represents one lead.

The given connection diagram is an example only.

The motor must be protected against overloads and short-circuits.

When installing the motor, always connect the earth, using the earthing screw in the terminal box or on the motor frame. Always check local regulations and demands.

The manufacturer cannot be held responsible for damage due to incorrect installation or use.

Free circulation of fresh air for cooling the motor must be guaranteed.

The maximum ambient temperature must not exceed the given value that is indicated on the nameplate and in the motor certificate.

To guarantee the explosion proof protection, certified explosion proof cable glands with sealing joints adapted to the cable diameters, must be used.

**THE MOTOR WILL LOSE ITS EXPLOSION PROOF CHARACTERISTICS IF THE CABLE AND GLANDS ARE NOT FITTED CORRECTLY!**

## ELNOR MOTORS NV

Note: If a spare opening for a cable gland isn't used, only the use of a certified explosion proof plug retains the explosion proof characteristics.

Particular attention is to be given to the fixing torque of bolts and screws. The motor fixing bolts are factory mounted with the correct torque and should not be touched.

It may be necessary to open the terminal box for connecting the motor. When re-mounting the cover, only use the original screws. In order to prevent damage to the motor components, never apply the maximum permissible torque for the applied bolts and nuts.

**IMPORTANT:** Firstly tighten all screws by hand before applying the full torque. Then tighten the screws until the spring ring is flat.

*Using a pulley or a coupling device:*

Apply only well balanced discs and couplings. Check the alignment after assembling

Take care while mounting of the pulley on the shaft: Hammering on the shaft will damage the motor bearings. Pulleys should only be mounted with appropriate mounting tools that do not stress the motor bearings.

Following these recommendations will greatly increase the expected motor bearing life.

Safety regulations in respect of guarding couplings and belts from being accidentally touched must be applied.

*Use of a frequency converter:*

In areas with an explosion risk, the use of the motor over a frequency converter is limited.

The frequency converter must in such case be placed outside the explosion-endangered area. If the frequency converter needs to be placed inside the explosion-endangered area, the additional requirements for such an installation must be respected.

It should be verified that the functioning of the motor is not influenced in a way that the requirements for Ex-environments are no longer satisfied.

Check the corresponding motor Ex certificate for info on this subject.

## MOTOR PROTECTION

If the motor is equipped with an automatic reset thermal protection, the motor will in case of thermal cutout restart automatically and without warning after a certain cooling period. Contact the manufacturer if you need more information on the type of protection that is used.

If the motor is supplied with a thermal protection that is brought out separately, the user must connect the protection in a way that the motor is switched off when the protector switches.

## MAINTENANCE

The maintenance of the motor can be limited to periodic inspection of the ventilation circuit, to keep it conveniently unobstructed, and to the replacement of the bearings if needed; this period depends on the working conditions and ambient. Re-greasing is not necessary, the ball bearing are lubricated for life.

In the case of DC motors with brushes in continuous contact with the slip rings, the slip rings, the brushes and the brush-holders should be periodically cleaned by vacuum cleaning.

## REPAIR

The explosion proof motor must not be opened while the motor is energised, or in the presence of danger of explosions.

Qualified persons only may do repair or service of the motor. If the customer himself carries out the operation, he must observe the valid standards. If a repairer treats the motor, he has to hand a certificate of conformity to the user.

ELNOR MOTORS NV

The manufacturer is not responsible for motors that are modified without his written agreement.

## SPARE PARTS

Only use original components for the repair of defect components.

For each order of spare parts, the type and number of the motor must be given; these data are indicated on the nameplate.

## WARRANTY

Warranty matters are treated in accordance with our general conditions of sale, that are valid at the time of delivery.

## MARKING OF ATEX CERTIFIED MOTORS

The motor marking contains the following information with regards to the Ex protection:

**CE xxxx Ex II 2 G/D                    ISSeP 01 ATEX yyy X EExd II B T4**

**CE** CE marking

**xxxx** ID of notified body responsible for surveillance

**Ex** Community mark for explosion proof equipment

**II** Field of application (Group II includes all fields of application except mining)

**2** Category of protection: For group II: 3 (Normal), 2 (High level) or 1 (Very high level)

**G/D** Gas and/or dust hazardous locations (G, D, G/D)

**ISSeP** Notified body

**01** Year of emission (2001, 2002, 2003, ...)

**ATEX** ATEX directive

**yyy** Consecutive number of the year

**X** Special conditions for safe use (if any)

**EExd** Type of protection (flameproof)

**II** Group of equipment

**B** Gas group (the classification of gases into groups is described in the standard EN50014)

**T4** Temperature classification (T3 to T6, see table below)

Temperature Class (Group II)	T3	T4	T5	T6
Maximum surface temperature	200°C	135°C	100°C	85°C

The maximum surface temperature of equipment must always be lower than the ignition temperature of the gas present in the hazardous area.

## SAFETY CONSIDERATIONS

During normal use, the motor may get hot. (See above table of surface temperatures.) Precautions may be needed to avoid the risk of burns.

The motor shaft turns at the speed that is indicated on the nameplate, and is potentially dangerous. Precautions may be needed to ensure safe use.

In general, the relevant safety prescriptions for machined must be respected.

ELNOR MOTORS NV

**MANUFACTURER INFORMATION:**

ELNOR MOTORS NV  
De Costerstraat 45  
B-3150 HAACHT  
BELGIUM

Telephone: +32 16 60 13 94  
Fax: +32 16 60 64 40  
E-mail [info@elnor.be](mailto:info@elnor.be)  
Internet <http://www.elnor.be>

This document has been made with the greatest care. It is meant as a general guideline and it is not meant to be complete. This document is subject to alterations, check the library section of our website for the most recent version. Always follow relevant local and international regulations and guidelines.

**Certificate for motors with mark „EEX“**

Institut Scientifique de Service Public



<p>(1) <b>EC TYPE EXAMINATION CERTIFICATE</b></p> <p>(2) <b>Equipment or protective system intended for use in potentially explosive atmospheres</b> <b>Directive 94/9/EC</b></p> <p>(3) EC type examination certificate number: <b>ISSeP02ATEX020</b></p> <p>(4) Equipment or protective system: Motor - Series BA (V/X) 3xy * *</p> <p>(5) Applicant – Manufacturer : <b>ELNOR MOTORS N.V.</b></p> <p>(6) Address: <b>De Costerstraat 45 3150 Haacht (Wespelaar)</b></p> <p>(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.</p> <p>(8) ISSeP, notified body n° 492 in accordance with article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in annex II to the Directive.</p> <p>The examination and test results are recorded in confidential report n 01185.</p> <p>(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with: <b>EN 50014:1997 + A1 et A2: 1999      EN 50018:2000      EN 50281-1-1:1998</b></p> <p>(10) If the symbol "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.</p> <p>(11) This EC TYPE EXAMINATION CERTIFICATE relates only to the design, examination and tests of the specified equipment or protective system in accordance to the Directive 94/9/EC. Further requirements of this Directive may apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.</p> <p>(12) The marking of the equipment or protective system shall include the following indications:</p> <p style="text-align: center;"> <b>II 2 G D      EEx d IIB T6 to T3 IP 65</b></p>	
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Colfontaine, the 29.04.2002

**Renaud Alain**  
 Manager of Colfontaine division

INSTITUT SCIENTIFIQUE DE SERVICE PUBLIC  
Rue Grande, 60 - B7340 Colfontaine  
Tel: ++ 32 65 610811 - Fax: ++ 32 65 610808

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(13)

**SCHEDULE**

(14)

**EC TYPE EXAMINATION CERTIFICATE N° ISSeP02ATEX020**

(15) Description of the equipment or protective system:

Three-phase asynchronous motor :BA(V/X)3\*\*TR

Single-phase asynchronous motor :BA(V/X)3\*\*C or E or CP

The flameproof enclosure of this motor consists of a carcass made of steel and end shields made of cast iron.

The motor may be equipped with:

- a terminal box compartment. In this case an additional marking will indicate that the insulation of the supply cable provided by the user shall be compatible with a temperature of at least 100°C.
- an external fan with fan hood
- two ends shaft
- an operating rod for push button mounted on the terminal box compartment suitable to reset the manual thermal protection.

**Temperature classes**

The motors on S1 duty service provided with an external fan or cooled by the process have the temperature classes T4 or T3. These motors have the temperature classes T6 or T5 if they are equipped with a thermal protection suitable to the temperature class.

The motors with natural cooling & the motors energised by converters and the motors on S2 to S9 duty service are provided with a thermal protection or a PTC thermistance suitable to the temperature class - to see documents from the manufacturer - Ref. : ES:1044 and ES:2011

**Electrical characteristics**

Power range : from 0.018 kW to 2.2 kW

Voltages supply : up to 660 VAC - 50 / 60 Hz

Insulation class :F

**Routine test**

Each apparatus shall be submitted to the routine verifications and tests necessary to ensure that it complies with the specification submitted to the testing station with the prototype.

(16) Report n° 01185 of 24.04.2002 composed in total of 26 pages

The letters from the manufacturer Ref. ES: 1044 of 21 December 2001 (5 pages) and ES: 2011 of 28 March 2002 (2 pages)

The manual of instructions of the manufacturer signed on 21.12.2001 (4 pages)

The description of the type designations – document signed on 21.12.2001(1 page)

The technical notes related to the thermal protections (35 pages)

The results of electrical load tests performed on the motor BAV370CPIIAR dated 12 and 13 December 2001 signed on 21.12.2001 (2 pages)

The data related to the self-adhesive marking plate - document signed on 28.03.2002 (1 page)

The data sheets related to the material of the marking plate - documents signed on 21.12.2001 (4 pages)

The specifications of the material of the fan dated October 1998 - document signed on 18.04.2002 (1 page)

The document Table n° MIS / E-4d related to the insulation system of the motor dated October 1994 - Rev May 2001 signed on 21.12.2001 (1 page)

The calculation sheets related to the expansion of the enclosure with regards to the pressure dated 20.12.2001 signed on 21.12.2001 (5 pages).

The data sheets related to the parts of the flameproof enclosure dated 17.12.2001 - Rev. of 22.03.2002 - signed on 28.03.2002 (3 pages)

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(13)

**SCHEDULE**

(14)

**EC TYPE EXAMINATION CERTIFICATE N<sup>R</sup> ISSeP02ATEX0\*\*\***

(16)

**The drawings:**

107991400D of 2.12.1996 Rev. D of 15.11.2000 signed on 21.12.2001  
200000210 of 19.11.01 signed on 21.12.2001  
230000281A of 1.03.01 Rev. A of 8.11.2001 signed on 21.12.2001  
230000285A of 17.12.2001 Rev. A of 18.04.2002 signed on 18.04.2002  
240000406A of 14.12.2001 Rev. A of 22.03.2002 signed on 28.03.2002  
507960325B of 29.11.2001 Rev. B of 29.11.2001 signed on 28.03.2002  
507960350D of 29.11.2001 Rev. D of 22.03.2002 signed on 28.03.2002  
507991425B of 19.12.1996 Rev. B of 8.11.2001 signed on 21.12.2001  
507992201 of 19.12.2001 signed on 21.12.2001  
612002742B of 29.11.2001 Rev. B of 22.03.2002 signed on 28.03.2002  
816122455B of 17.12.2001 Rev. B of 17.12.2001 signed on 28.03.2002  
816122880A of 26.11.2001 Rev. A of 22.03.2002 signed on 28.03.2002  
816122881 of 26.11.2001 signed on 21.12.2001  
816122882A of 17.12.2001 Rev. A of 22.03.2002 signed on 28.03.2002  
816122883 of 12.12.2001 signed on 21.12.2001  
816122884 of 14.12.2001 signed on 21.12.2001  
21-250B of 22.04.1994 Rev B of 19.02.1997 signed on 28.03.2002  
835 C of 23.05.95

(17) Special conditions for safe use: none

(18) Essential Health and Safety Requirements: none

This certificate may only be reproduced in its entirety and without any change, schedule included

**„INSTRUCTIONS MANUAL“ for motors with mark „EX“**

ELNOR MOTORS NV

**INSTRUCTIONS MANUAL: EXPLOSION PROOF MOTORS****INTRODUCTION**

An explosion-proof, and in particular a flameproof motor, is one that is inherently safe when working in potentially explosive atmospheres.

This means that its construction and assembly are designed so that ingress of explosive gases or dusts is rendered harmless for the environment.

In the event of accidental ignition, provoking an explosion inside the motor housing, the motor shell and brackets are strong enough to resist the internal pressure created by this explosion.

Moreover, assembly joints and shaft clearance must be long enough and offer minimum play, so that hot gases or dusts resulting from an explosion will be cooled sufficiently to create no possibility of an explosion outside the motor.

The outside temperature of the motor enclosure must also be kept well below the flash point of the gases or dusts present in the hazardous atmosphere, both in normal and abnormal working conditions.

Finally, it is the manufacturer's concern that components inside the motor should be able to withstand an occasional explosion without being adversely affected.

The degree of risk is dependant on the constituents of the hazardous atmosphere: even combustible dust can become explosive when spread in the air in the right proportion.

Therefore, existing risks have been divided into categories, depending on the temperature at which the gas, dust or vapour mixtures become flammable, and also on their explosive energy.

For each of these, specific safety rules have been evolved on a European level.

Compliance with these rules is verified by an Ex notified body, approved for certification in accordance with article 9 of the European Community Council directive, no 94/9/CEE of 23 march 1994.

Certification delivered by any of the notified bodies is automatically valid in all CEE countries. It is recognised by all European adherent countries and also very seriously considered in many countries overseas, U.S.A. included.

In Belgium, it is the "Institut Scientifique de Service Public", in short ISSeP, which has been chosen for its long experience in problems of safety in mining industries.

As explosion proof motors are constructed with special materials and technologies that comply with the legal regulations concerning potentially explosive atmospheres, a wrong connection or a minor modification of the motor destroys the compliance with security regulations. The rules concerning explosion proof apparatus must be observed unconditionally. Note that our motors are approved for a specific group of hazardous areas and temperature classes.

**USE OF Ex d II B / IP6x MOTORS**

The user is responsible for the choice of the type of explosion proof motor. He has to take into account the explosion risks area in which the motor will run (classification of hazardous areas, temperature class,...).

Before installation, the user has to check if the group and protection class, marked on the motor label, corresponds with the requested conditions.

**INCOMING INSPECTION**

Inspect the motor to detect any signs of damage during the transport.

Check that the motor nameplate data complies with your order or specification. In the unlikely event of a claim, please contact our Sales Office.

## ELNOR MOTORS NV

**STORAGE**

The motor should be stored in a clean, dry and vibrations free environment. . If the motor is to be stored for a long period of time, the machined surfaces protected with anti-rust coating should be checked and "touched up" if necessary.

If the motor is fitted with anti-condensation heaters, these should be connected during the storage period.

**MOUNTING AND START UP**

Electric data of the motor, valid for the rated power, can be found on the nameplate.

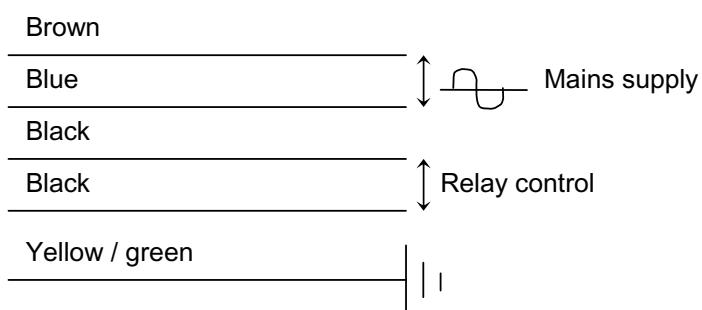
It is the responsibility of the user to ensure that the motor nameplate voltage and frequency are the same as the mains supply.

Connection to the mains supply should only be executed by a recognised professional, respecting local demands and regulations.

The user must ensure that the diameter of the cable is adequate for the voltage and current involved. (See nameplate data of motor)

The connection of the wires must be done as described in the connection diagram that is delivered with the motor. The connection diagram is usually located inside the cover of the terminal box. If the motor does not have a terminal box, it is located on the housing or attached to the cable.

The connection diagram is structured as follows: (see example)



The leads can be coloured or numbered. Each line represents one lead.

The given connection diagram is an example only.

The motor must be protected against overloads and short-circuits.

When installing the motor, always connect the earth, using the earthing screw in the terminal box or on the motor frame. Always check local regulations and demands.

The manufacturer cannot be held responsible for damage due to incorrect installation or use.

Free circulation of fresh air for cooling the motor must be guaranteed

The maximum ambient temperature must not exceed the given value that is indicated on the nameplate and in the motor certificate.

To guarantee the explosion proof protection, certified explosion proof cable glands with sealing joints adapted to the cable diameters, must be used.

**THE MOTOR WILL LOSE ITS EXPLOSION PROOF CHARACTERISTICS IF THE CABLE AND GLANDS ARE NOT FITTED CORRECTLY!**

**ELNOR MOTORS NV**

Note: If a spare opening for a cable gland isn't used, only the use of a certified explosion proof plug retains the explosion proof characteristics.

Particular attention is to be given to the fixing torque of bolts and screws. The motor fixing bolts are factory mounted with the correct torque and should not be touched.

It may be necessary to open the terminal box for connecting the motor. When re-mounting the cover, only use the original screws.

**IMPORTANT:** Firstly tighten all screws by hand before applying the full torque. Then tighten the screws until the spring ring is flat.

*Using a pulley or a coupling device:*

Apply only well balanced discs and couplings. Check the alignment after assembling

Take care while mounting of the pulley on the shaft: Hammering on the shaft will damage the motor bearings. Pulleys should only be mounted with appropriate mounting tools that do not stress the motor bearings.

Following these recommendations will greatly increase the expected motor bearing life.

Safety regulations in respect of guarding couplings and belts from being accidentally touched must be applied.

*Use of a frequency converter:*

In areas with an explosion risk, the use of the motor over a frequency converter is limited.

The frequency converter must in such case be placed outside the explosion-endangered area. If the frequency converter needs to be placed inside the explosion-endangered area, the additional requirements for such an installation must be respected.

It should be verified that the functioning of the motor is not influenced in a way that the requirements for Ex-environments are no longer satisfied.

**MOTOR PROTECTION**

If the motor is equipped with an automatic reset thermal protection, the motor will in case of thermal cutout restart automatically and without warning after a certain cooling period. Contact the manufacturer if you need more information on the type of protection that is used.

If the motor is supplied with a thermal protection that is brought out separately, the user must connect the protection in a way that the motor is switched off when the protector switches.

**MAINTENANCE**

The maintenance of the motor can be limited to periodic inspection of the ventilation circuit, to keep it conveniently unobstructed, and to the replacement of the bearings; this period depends on the working conditions and ambient. Re-greasing is not necessary, the ball bearing are lubricated for life. In the presence of dust, the motor needs to be cleaned on a regular basis.

In the case of DC motors with brushes in continuous contact with the slip rings, the slip rings, the brushes and the brush-holders should be periodically cleaned by vacuum cleaning.

**REPAIR**

The explosion proof motor must not be opened while the motor is energised.

Qualified persons only may do repair or service of the motor. If the customer himself carries out the operation, he must observe the valid standards. If a repairer treats the motor, he has to hand a certificate of conformity to the user.

The manufacturer is not responsible for motors that are modified or opened without his written agreement.

ELNOR MOTORS NV

**SPARE PARTS**

For each order of spare parts, the type and number of the motor must be given; these data are indicated on the nameplate.

**MARKING OF ATEX CERTIFIED MOTORS**

The motor marking contains the following information with regards to the Ex protection:

**CE xxxx      Ex II 2 G      ISSeP 08 ATEX yyy X      Ex d II B T4**

CE	CE marking
xxxx	ID of notified body responsible for surveillance
Ex	Community mark for explosion proof equipment
II	Field of application (Group II includes all fields of application except mining)
2	Category of protection: For group II: 3 (Normal), 2 (High level) or 1 (Very high level)
G	Gas hazardous locations (G, D)
ISSeP	Notified body
08	Year of emission (2007, 2008, 2009, ...)
ATEX	ATEX directive
yyy	Consecutive number of the year
X	Special conditions for safe use (if any)
Ex d	Type of protection (flameproof for use in an explosive gas atmosphere)
II	Group of equipment
B	Gas group (the classification of gases into groups is described in the standard EN600079)
T4	Temperature classification (T3 to T6, see table below)
21	Category of protection: 22 (Normal), 21 (High level) or 20 (Very high level)
IP	Ingress protection

Temperature Class (Group II)	T3	T4	T5	T6
Maximum surface temperature	200°C	135°C	100°C	85°C

The maximum surface temperature of equipment must always be lower than the ignition temperature of the gas in the hazardous area.

**SAFETY CONSIDERATIONS**

During normal use, the motor may get hot. (See above table of surface temperatures.) Precautions may be needed to avoid the risk of burns.

The motor shaft turns at the speed that is indicated on the nameplate, and is potentially dangerous. Precautions may be needed to ensure safe use.

In general, the relevant safety prescriptions for machines must be respected.

## ELNOR MOTORS NV

**EUROPEAN DIRECTIVES:**

Description	Directive reference
Directive for explosive atmospheres (ATEX)	94/9/EC
Electromagnetic Compatibility (EMC)	2004/108/EG
Low voltage directive (LVD)	2006/95/EC
Machinery directive	98/37/EC

**EXPLOSION PROOF STANDARDS TAKEN INTO CONSIDERATION DURING MANUFACTURING:**

Electrical apparatus for explosive gas atmospheres – part 0: general requirements	EN 60079-0
Electrical apparatus for explosive gas atmospheres – Part 1: Flameproof enclosure 'd'	EN 60079-1

**MANUFACTURER INFORMATION:**

ELNOR MOTORS NV  
De Costerstraat 45  
B-3150 HAACHT  
BELGIUM

Telephone: +32 16 60 13 94  
Fax: +32 16 60 64 40  
E-mail [info@elnor.be](mailto:info@elnor.be)  
Internet <http://www.elnor.be>

This document has been made with the greatest care and is correct at the time of printing. It is meant as a general guideline and it is not meant to be complete. Always check with relevant regulations and guidelines.

**Certificate for motors with mark „EX“**

**Siège social et site de Liège :**  
Rue du Chéra, 200  
B-4000 Liège  
Tél : +32(0)4.229.83.11  
Fax : +32(0)4.252.46.05

**Site de Colfontaine :**  
Zoning A. Schweitzer,  
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B-7340 Colfontaine  
Tél : +32(0)65.61.08.11  
Fax : +32(0)65.61.08.08

**e-mail :** direction@issep.be  
**site web :** http://www.issep.be

<p>(1) EC TYPE EXAMINATION CERTIFICATE</p> <p>(2) <b>Equipment or protective system intended for use in potentially explosive atmospheres</b> Directive 94/9/EC</p> <p>(3) EC type examination certificate number: <b>ISSeP09ATEX014X</b></p> <p>(4) Equipment : Asynchronous flameproof motors Series BA(V/X) 3xy ***</p> <p>(5) Applicant – Manufacturer: ELNOR MOTORS N.V.</p> <p>(6) Address: De Costerstraat 45 3150 Haacht (Wespelaar)</p> <p>(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.</p> <p>(8) ISSeP, notified body n° 492 in accordance with article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in annex II to the Directive.</p> <p>The examination and test results are recorded in confidential report no 07087</p> <p>(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with: EN 60079-0:2006 (IEC 60079-0:2004) IEC 60079-0:2007 EN 60079-1:2007 (IEC 60079-1: 2007)</p> <p>(10) If the symbol "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate</p> <p>(11) This EC TYPE EXAMINATION CERTIFICATE relates only to the design, examination and tests of the specified equipment or protective system in accordance to the Directive 94/9/EC. Further requirements of this Directive may apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.</p> <p>(12) The marking of the equipment or protective system shall include the following indications:   II 2 G Ex d IIB T6 to T3 (according to standard EN 60079-0 : 2006)   Ex d IIB T6 to T3 Gb (according to standard IEC 60079-0 : 2007)           </p> <p style="text-align: right;">Colfontaine, the 04.03.2009</p> <p><i>[Signature]</i> Marcel Lambert, Manager.</p> <p>This certificate may only be reproduced in its entirety and without any change, schedule included</p>
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(13)	<b>SCHEDULE</b>
(14)	<b>EC TYPE EXAMINATION CERTIFICATE No ISSeP09ATEX014X</b>
(15)	<p>Description of the equipment or protective system:          Three-phase asynchronous motor :BA(V/X) 3xyTR          Single-phase asynchronous motor :BA(V/X) 3xy C or E or CP          The flameproof enclosure of this motor consists of a carcass made of steel and end shields made of cast iron or aluminium alloy.          The fastenings are made by M8 bolts of property class 4.6 ,M8 internal socket head screws of property class 8.8 and M8 nuts of property class 5          The motor may be equipped with two ends shaft.</p> <p><u>Temperature classes</u>          The motors on S1 duty service cooled by the process have the temperature class T3. These motors have the temperature classes T6 or T5 or T4 if they are equipped with a thermal protection suitable to the temperature class.          The motors with natural cooling &amp; the motors energised by converters and the motors on S2 to S9 duty service are provided with a thermal protection or a PTC thermistance suitable to the temperature class - to see documents from the manufacturer</p> <p><u>Electrical characteristics</u>          Power range : up to 3 kW          Voltages supply : up to 695 VAC - 50 / 60 Hz          Insulation class : F</p> <p><u>Eventual prescriptions</u>          Ambient temperature range: -40°C up to +70°C</p> <p><u>Routine test</u>          Each apparatus shall be submitted to the routine verifications and tests necessary to ensure that it complies with the specification submitted to the testing station with the prototype.          The motors equipped with cast iron end shields are exempted from the overpressure routine test. However a control of the welding of the carcass shall be made.          The motors equipped with aluminium alloy end shields shall be submitted to an overpressure routine test under the value of 1101 kPa (11.01 bar).</p>
(16)	<p>Report no 07087 dated 2.03.2009 composed in total of 27 pages.          The letter from the manufacturer Reference ES:8.030 of 27 October 2008          The manual of instructions of the manufacturer of 8.11.2007 signed on 10.01.2008 (5 pages)          The data sheets related to the parts of the flameproof enclosure dated 4 January 2008 - Rev of 27 February 2009 signed on 27.02.2009 (4 pages)          The data related to the self-adhesive marking plate - document of 10.05.2007 signed on 4.07.2007 (1 page)          The document related to the minimum radial clearance (k) and the maximum radial clearance (m)of the shaft glands, dated 10.01.2008 (1 page)          The document related to the discharge time of the capacitor dated 25.08.2008 (1 page)</p>

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## SCHEDULE

### EC TYPE EXAMINATION CERTIFICATE No ISSEp09ATEX014X

(16) The drawings  
240000423A of 10.01.2008 Rev.A of 15.09.2008  
507960350E Rev.E of 2.07.2007  
507991425E Rev.E of 7.11.2008  
806123063 of 10.01.2008  
816122880B of 26.11.2001 Rev.B of 24.02.2009  
816122881 of 26.11.2001  
816122883 of 12.12.2001  
816122884A of 14.12.2001 Rev.A of 20.02.2009  
835 C of 23.05.1995

(17) Special conditions for safe use: symbol X  
• An appropriate connection of the free end of the cable shall be foreseen when the motor is provided with a supply cable which is permanently connected to it.

—

(18) Essential Health and Safety Requirements: covered by the standards listed under point 9 of the present certificate and by the descriptive documents from the manufacturer.

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## VARIATION

## EC TYPE EXAMINATION CERTIFICATE N° ISSeP09ATEX014X/1

## (14) Equipment:

Three-phase asynchronous motors: BA(X)3xy TR  
Single-phase asynchronous motors: BA(X)3xy C or E or CP

## (15) Subject to the variation:

To allow the mounting of the aluminium alloy cover described on the drawing 517994625 for the version of motor equipped with a terminal box.  
The motors equipped with this cover are exempted from the overpressure routine test.  
However a control of the welding of the carcass shall be made

Marking: Unchanged

## Eventual prescriptions

The ambient temperature range: -40°C up to +70°C

## (16) Report n° 09131 of 26.01.2010 (16 pages)

The data sheets related to the construction elements of the flameproof enclosure dated 15.01.2010

(5 pages)

The e-mail from the manufacturer of 21 January 2010

The drawing

517994625 of 2.11.2009

## (17) Special conditions for safe use: Unchanged

## (18) Essential Health and Safety Requirements: Covered by the standards listed at point 9 of the initial certificate

Colfontaine, 29.01.2010

Lambert Marcel,  
Directeur

INSTITUT SCIENTIFIQUE DE SERVICE PUBLIC  
Zoning A. Schweitzer - B 7340 Colfontaine (Wasmes)  
Tél: ++ 32 65 610811 – Fax: ++ 32 65 610808

This document may not be used without the original certificate



## VARIATION

### EC TYPE EXAMINATION CERTIFICATE N° ISSEp09ATEX014/2

(14) Equipment:

Three-phase asynchronous motors: BA(X)3xy TR  
 Single-phase asynchronous motors: BA(X)3xy C or E or CP

(15) Subject to the variation:

To allow the mounting of aluminium alloy end shields described on the drawings 517412215D and 517431005B  
 To allow the mounting of an aluminium alloy carcass (stator housing)  
 To attest the update of several drawings  
 The conformity assessment has been made on basis of the standard IEC 60079-0 edition 2011.

Marking: Unchanged except the indication of the range of temperature classes in the code: T6...T3

Eventual prescriptions

The ambient temperature range: -40°C up to +70°C

(16) Report n° 11122 of 11.07.2012 (15 pages)

The data sheets related to the construction elements of the flameproof enclosure dated 29.06.2012 (4 pages)

The e-mail from the manufacturer of 11.07.2012

The drawings

107991400G of 3.06.2010

117412200F of 20.09.2011

117431000C of 6.09.2011

117994600H of 19.03.2010

230000281C of 1.06.2005

507960325D of 21.12.2006

507960345D of 23.09.2010

507991425F of 19.02.2010

517412215D of 7.07.2011

517431005B of 7.09.2011

517992201J of 1.12.2010

517994601H of 20.10.2009

816122883A of 5.12.2011

816122884C of 29.11.2011

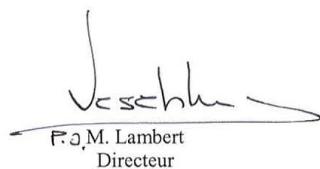
816123090 of 18.02.2010

(17) Special condition for safe use: Unchanged

(18) Essential Health and Safety Requirements: Covered by the standards listed at point 9 of the initial certificate

Colfontaine, 17.07.2012

INSTITUT SCIENTIFIQUE DE SERVICE PUBLIC  
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 P.-O. M. Lambert  
 Directeur

This document may not be used without the original certificate



**EG-Konformitätserklärung für Maschinen  
EC Declaration of Conformity of the Machinery  
Déclaration CE de conformité des machines**

Hersteller / Manufacturer / Fabricant:

VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Hiermit erklärt der Hersteller, dass die Maschine konform ist mit den Bestimmungen der Richtlinie 2006/42/EG. Hereby the manufacturer declares that the machinery is in conformity with the directive 2006/42/EC.

Par la présente, le fabricant déclare, que la machine est conforme à directive 2006/42/CE.

Membranvakuumpumpe / Diaphragm vacuum pump / Pompe à membrane:

Typ / Type / Type: MZ 2C EX / MZ 2C EX + AK + EK / MZ 2C + IK + EK / MD 4C EX / MD 4C EX + AK + EK / MV 10C EX / MV 10C EX + AK + EK

Artikelnummer / Order number / Numéro d'article: 696920 / 696921 / 2614231 / 696930 / 696931 / 696945 / 2614250

Seriennummer / Serial number / Numéro de série: Siehe Typenschild / See rating plate / Voir plaque signalétique

Die Maschine ist konform mit weiteren Richtlinien / The machinery is in conformity with other directives / La machine est conforme à d'autres directives:

2006/95/EG, 2004/108/EG, 94/9/EG, 2011/65/EU

Angewandte harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées:

DIN EN 12100:2004, DIN EN 61010-1:2010 (Ed. 3), DIN EN 1012-2:2011, DIN EN 61326-1:2006,

DIN EN 1127-1:2011, DIN EN 13463-1:2009, DIN EN 50581:2013,

Motor / motor / moteur: „EEX“: EN 50014:1997 + A1/A2:1999, EN 50018:2000, EN 50281-1-1:1998;

Motor / motor / moteur: „EX“: EN 60079-0:2006, EN 60079-1:2007

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person authorised to compile the technical file / Personne autorisée à constituer le dossier technique:

Dr. J. Dirscherl · VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Wertheim, 12.02.2014

.....  
Ort, Datum / place, date / lieu, date

(Dr. F. Gitmans)

Geschäftsführer / Managing director / Gérant

ppa.

(Dr. J. Dirscherl)

Technischer Leiter / Technical Director / Directeur technique

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